DOCUMENT RESUME

ED 312 491 CE 053 636

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TITLE V-TECS Guide for Farm Equipment Operator.
INSTITUTION South Carolina State Dept. of Education, Columbia. Office of Vocational Education.
PUB DATE 88
NOTE 435p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC18 Plus Postage.
DESCRIPTORS *Agricultural Education; *Agricultural Machinery; *Agricultural Machinery Occupations; Agricultural Production; Behavioral Objectives; *Competency Based Education; *Machine Repairers; Machinery Industry; Mechanics (Process); Occupational Information

ABSTRACT

The materials in this document are an extension of a catalog of duties, tasks, and performance objectives relevant to occupation of farm equipment operator. The duties are performing routine administrative functions, performing scheduled farm machinery maintenance, performing nonscheduled farm machinery maintenance, and performing field operations. This document provides the following for each occupational task within each duty: (1) a standard of performance; (2) the conditions under which the task is to be performed; (3) enabling objectives; (4) at least one resource; (5) one or more teaching activities; (6) criterion-referenced measures of student performance; (7) answers to those measures; (8) practical applications; and (9) a suggested method of evaluating the practical application. The appendices contain a list of tasks and job titles; definitions of terms; a list of tools and equipment; reference to individuals and printed materials who are the source of the information contained in the document; a list of 33 items called "state-of-the-art literature"; and a 26-item bibliography. (CML).

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V-TECS GUIDE
FOR
FARM EQUIPMENT OPERATOR

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1988

CE053636

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ACKNOWLEDGMENTS

The Farm Equipment Operator V-TECS Guide was developed from the Farm Equipment Operator V-TECS Catalog by a committee of Agricultural Education Instructors in South Carolina. Special appreciation is extended to the following teachers who devoted their time and talents to this project:

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The State Office of Vocational Education staff members who assisted the committee were Steve Willis (State Consultant, Agricultural Education), Ms. Shirley S. Cullen (Sex Equity Consultant), Elizabeth Yergason (Editor), and Barbara Richardson, (Word Processing Operator).

Upon completion of the writing of Farm Equipment Operator V-TECS Guide, six educators and six incumbent workers were selected to field review the materials for validity and reliability. These individuals are to be commended for their efforts in assisting with this project. The field reviewers are:

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INTRODUCTION

A V-TECS Guide is an extension or a continuation of one or more V-TECS Catalogs. The V-TECS Catalog is a composition of duties, tasks, performance objectives, and performance guides which deal with the psychomotor aspect of an occupation. The catalog can be considered the blueprint of an occupation.

The catalog serves as the foundation for the V-TECS Guide. Experience has shown that the art of learning can be taught while teaching subject matter. A V-TECS Guide provides an efficient method for this process. The Guide addresses the three domains of learning: psychomotor, cognitive, and affective. The following is a brief explanation of each.

Psychomotor

Manipulative skills, such as sharpening a pencil and making a bulletin board display, are representative of activities that are psychomotor in nature. These tasks are identified in a catalog and grouped by duties and objectives. Each performance objective has a performance standard which must be met to demonstrate student proficiency in the manipulative aspect of the task.

Cognitive

Cognition is the mental process by which knowledge is acquired. To perform psychomotor tasks, students must think. Effective thinking is necessary for successful performance of job tasks. Students gain cognition through real and vicarious experiences. This guide enables the instructor to provide decision-making opportunities for students, thus developing their cognitive skills.

Affective

The affective domain deals with attitudes, interests, and values development. Desirable behavior is the learning outcome of the affective domain. This guide presents activities created to promote an understanding of self and others in a working environment. The instructor is encouraged to use the activities to stress how attitudes, values, and goal attainment influence working relationships and productivity.

USE OF V-TECS GUIDE

A V-TECS Guide is designed to provide job-relevant tasks, performance objectives, performance guides, resources, teaching activities, evaluation standards, and criterion-referenced measures. It may be used with any teaching method the instructor chooses. Although a guide contains suggestions for specific classroom activities for each identified task, teachers are encouraged to be creative in adapting the material to meet the particular needs of their students.

PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 1

TASK

Assign jobs

STANDARD OF PERFORMANCE OF TASK

Attending instructor must agree with the jobs assigned to operators based upon individual training records.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Two situations to assign work to other farm equipment operators
Necessary instruction
Individual training records

ENABLING OBJECTIVES

1. Read and interpret any instruction given.
2. Read and interpret training records.

RESOURCE

An Introduction to Agribusiness Management. pp. 79-92.

TEACHING ACTIVITIES

1. Discuss the importance of assigning jobs properly.
2. Demonstrate how to use the individual training records.
3. Discuss the importance of giving operators clear and complete instruction.
4. Demonstrate the steps in the performance guide.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. How well a job is performed depends a lot on to whom it is assigned. Why?
2. Individual training records are of much use in assigning jobs. How?
3. If an employee is injured while performing a job for which his records indicate he is unqualified, the employer may be held liable. Why?

PERFORMANCE OBJECTIVE 1

CRITERION-REFERENCED MEASURE (continued)

Answers

1. People have different abilities which determine how well suited they are for a particular job.
2. Training records give the supervisor a better idea of a person's abilities to perform certain tasks.
3. Employers and supervisors are held responsible for improperly assigning jobs.

Practical Application

The student will properly assign jobs.

Method of Evaluating Practical Application

Use Checklist Performance Objective 1 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 1 EVALUATION

ASSIGNING JOBS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Selected job to be assigned.		
2. Selected qualified operators to perform jobs.		
3. Gave farm equipment operators clear and complete instructions on what is to be done.		
4. Solicited questions from operators.		
5. Assigned designated tasks to operators.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 2

TASK

Contract for fuel supply

STANDARD OF PERFORMANCE OF TASK

The attending instructor must agree with the final contract based on negotiating the most economical contract for the farm's fuel supply providing for all fuel needs for a period of three months.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farming situation
Projected fuel prices
Projected fuel supply needs
Potential supplier

ENABLING OBJECTIVES

1. Read and interpret instructions given.
2. Perform common mathematical problems at a high school level.

RESOURCE

Fuels and Lubricants, Selecting and Storing. pp. 5-28.

TEACHING ACTIVITIES

1. Discuss the importance of contracting for a fuel supply.
2. Discuss how to estimate fuel supplies needed.
3. Discuss bidding techniques.
4. The student will complete the criterion-referenced questions attached to this lesson.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. How can you determine the reliability of a fuel supplier?
2. Which is safer, a verbal agreement or a signed contract?
3. Should you check a fuel supplier's reputation for service before contracting with him? (yes or no) why or why not?

PERFORMANCE OBJECTIVE 2

CRITERION-REFERENCED MEASURE (continued)

Answers

1. Check with other fuel customers.
2. Signed contract.
3. Yes - to gain information about the type of service rendered.

Practical Application

The student will properly contract for a fuel supply.

Method of Evaluating Practical Application

Use Checklist Performance Objective 2 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 2 EVALUATION
CONTRACTING FOR FUEL SUPPLY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Reviewed previous records to determine quantity and kind of fuel needed seasonally.		
2. Estimated and itemized quantity and kind of fuel supplies that will be needed for the coming year.		
3. Itemized special services fuel supplier will have to provide to get the fuel contract.		
4. Identified potential fuel suppliers who have the capability of supplying your needs.		
5. Checked with other fuel customers to determine reliability of potential fuel suppliers.		
6. Contacted potential fuel suppliers and asked them to bid on the contract to supply fuel needs for farming operation.		
7. Selected the most suitable supplier based upon above information.		
8. Signed contract or reached verbal agreement with selected supplier to supply fuel needs.		
9. Notified all bidders of acceptance/rejection of bid.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 3

TASK

Dismiss employee

STANDARD OF PERFORMANCE OF TASK

1. A conference must be held with the employee.
2. The reasons for dismissal must be explained to the employee.
3. The employee's point of view must be sought.
4. The employee's grievance rights must be explained.
5. The effective date of dismissal must be stated and the amount of severance pay to be given must be noted.
6. The employee must be provided a written notice of termination.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A situation requiring the dismissal of an employee
Circumstances leading up to the dismissal

ENABLING OBJECTIVES

1. Read and interpret written instructions.
2. Communicate effectively.

RESOURCE

An Introduction To Agribusiness Management. pp. 79-82.

TEACHING ACTIVITIES

1. Discuss the importance of dismissing employees in the proper way, and the ramifications of not doing so.
2. Discuss how to deal with a hostile employee.
3. Discuss grievance procedures.
4. Demonstrate the steps in the performance guide.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. The way to which an employee is dismissed is of some consequence to the employer. Why?
2. What is the purpose of grievance procedures?
3. Why do employees have certain legal rights concerning dismissal?

PERFORMANCE OBJECTIVE 3

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. The way an employee is dismissed may affect relations with other employees and may have legal ramifications.
2. To prevent misunderstanding and protect the employer legally.
3. To prevent an employee from being wrongfully dismissed, reduce misunderstanding, as well as protect employee legally.

Practical Application

The student will properly dismiss an employee.

Method of Evaluating Practical Application

Use Checklist Performance Objective 3 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 3 EVALUATION

DISMISSING AN EMPLOYEE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Reviewed the procedures to be followed and the circumstances leading up to the consideration of employee's dismissal.		
2. Scheduled a conference with employee.		
3. Reviewed employee's job performance.		
4. Pointed out deficiencies to employee.		
5. Allowed employee to present his or her point of view.		
6. Explained employee's grievance rights.		
7. Told employee that he or she is being dismissed, giving the effective date, and the amount of severance pay that will be received.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 4

TASK

Establish records for purchasing equipment

STANDARD OF PERFORMANCE OF TASK

Attending instructor must approve the record keeping system established.

Record must include the following:

1. Cost of fuel, lubricants, filters, repairs, and maintenance involved in using existing equipment (including the cost of delays due to time lost in repairing equipment).
2. Cost of hiring custom work (including losses due to delays in getting custom work done).
3. Performance rate of existing equipment (including quality of the work).
4. Cost of value of labor that would be saved by purchasing equipment.
5. Potential profit as a result of doing custom work for others.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farm operation in need of four major pieces of equipment

ENABLING OBJECTIVES

1. Read and interpret any written information such as records given.
2. Work mathematical problems at a high school level.

RESOURCE

Farm Business Management, pp. 146-151.

TEACHING ACTIVITIES

1. Discuss the importance of using records in making equipment purchasing decisions.
2. Discuss how to identify equipment needs.
3. Discuss hiring custom work.
4. Demonstrate the steps outlined in the performance guide.
5. The student will complete the steps in the performance evaluation.

PERFORMANCE OBJECTIVE 4

CRITERION-REFERENCED MEASURE

Questions

1. When making decisions concerning new equipment purchases, careful records must be kept on existing equipment performance. Why?
2. Should you consider the cost of hiring custom work when making equipment purchasing decisions?
3. When should new equipment be bought?

Answers

1. In order to determine if existing equipment is operating efficiently and properly, records can be used to determine if it would be better to buy new equipment or maintain old equipment.
2. Yes - It may be cheaper than buying.
3. Only when it would be the most profitable approach. It may be better to hire custom work or maintain your old equipment.

Practical Application

The student will properly establish records for purchasing equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 4 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 4 EVALUATION

ESTABLISHING RECORDS FOR PURCHASING EQUIPMENT

Student's Name **Date**

DIRECTIONS TO STUDENT: Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR: Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained forms for establishing records.		
2. Identified equipment needs.		
3. Listed equipment needed on records.		
4. Determined need for purchasing equipment based on: a. Cost of fuel, lubricants, filters, repairs and maintenance in using existing equipment. b. Cost of hiring custom work. c. Performance rate of existing equipment. d. Value of labor saved by purchasing equipment.		
5. Listed purchase cost for various pieces of equipment needed.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 5

TASK

Hire employee (s)

STANDARD OF PERFORMANCE OF TASK

The selection must match with that of the instructor, determined from the selection of one applicant upon the basis of interest in the job.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A job opening
A Job description
Three applicants
Record of directly related work experience
A record of directly related job training
Interview questions

ENABLING OBJECTIVES

1. Identify duties in a job description.
2. Determine qualities of an individual over another individual.

RESOURCE

Livingstone. **Janus Job Interview Guide**. pp. 5-16.

TEACHING ACTIVITIES

1. Discuss what to expect from an applicant.
2. Demonstrate how to evaluate personal appearance as it effects the hiring process.
3. Review and explain the importance of knowing what you want and the conditions under which you hire an employee.
4. Have students practice receiving an applicant and evaluating that applicant's responses.
5. Have students practice evaluating and choosing one applicant over another.
6. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 5

CRITERION-REFERENCED MEASURE

Questions

1. Two people talking, one asking questions and one answering questions is an example of an ____________.
2. Which items should be contained on a personal data sheet?
   a. Your shoe size
   b. References
   c. Your grandmother's middle name
   d. Directions to the county store.
3. The term for non-verbal actions of an applicant is _______________ .

Answers

1. Interview
2. b
3. Body language

Practical Application

Using various methods outlined by the teacher, the student will demonstrate the ability to hire employees.

Method of Evaluating Practical Application

Use Checklist Performance Objective 5 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 5 EVALUATION

HIRING EMPLOYEE

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Reviewed job description.		
2. Reviewed prospective employees' applications.		
3. Interviewed each prospective employee. a. Discussed reason for seeking job. b. Discussed past work experience. c. Described job opening. d. Described working conditions. e. Described fringe benefits. f. Described advancement opportunities.		
4. Assessed qualifications of each applicant.		
5. Selected most qualified applicant based upon: a. Interest in the job. b. Work experience. c. Training.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 6

TASK

Maintain inventory lists

STANDARD OF PERFORMANCE OF TASK

All records must be 100 percent accurate, maintained for one month, indicating where property is located and including an identifiable description of the property.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An inventory list
Instructions for maintaining the list

ENABLING OBJECTIVES

1. Be familiar with inventory items.
2. Add numbers and groups of numbers.

RESOURCE

Osburn, et al., **Modern Agricultural Management**. pp. 184-198.

TEACHING ACTIVITIES

1. Identify and discuss items on the inventory list.
2. Demonstrate ability to add and group numbers from a list.
3. Identify and delete items which do not belong on inventory list.
4. Distinguish inventory items as received or dispursed.
5. Describe a method to inspect recordings.
6. Have student complete performance checklist attached to lesson.

CRITERION-REFERENCED MEASURE

Questions

1. Continue the grouping of these : 0010 - 0040, 33-63 18 - 48,______
   a. 0640 - 0658
   b. 140 - 170
   c. 180 - 250
2. ______________ are items that are out going.
3. Equipment on hand and inventory list should be __________ .

PERFORMANCE OBJECTIVE 6

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. b
2. Disbursements
3. Equal

Practical Application

The student will properly maintain an inventory list for teacher inspection.

Method of Evaluating Practical Application

Use Checklist Performance Objective 6 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 6 EVALUATION

MAINTAINING INVENTORY LIST

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Added all new purchases of equipment and supplies to inventory list according to prescribed procedures.		
2. Deleted equipment which has become obsolete, worn out, lost, stolen or transferred.		
3. Recorded transfers of equipment within the organization.		
4. At end of the one-month period, physically checked equipment against inventory to determine accuracy of records.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 7

TASK

Maintain service records and logs

STANDARD OF PERFORMANCE OF TASK

Records and logs must be maintained for each piece of equipment, be 100 percent accurate, and maintained for a period of one month. They must include service date, equipment number or description, service logs or maintenance performed, and daily inspection notes.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Two pieces of farm equipment
Service records
Logs

ENABLING OBJECTIVES

1. Identify serial numbers on parts and equipment.
2. Be familiar with equipment maintenance operations.

RESOURCE

Osburn, et al. , **Modern Agricultural Management**. pp. 82-86.

TEACHING ACTIVITIES

1. Distribute and analyze records and history of equipment.
2. Express concern for neatness and appearance of log book.
3. The student will prepare maintenance schedules for equipment.
4. Review a sample timed increment log book.
5. Insure accuracy of individual records by spot checking.
6. Have students complete performance checklist attached to lesson.

PERFORMANCE OBJECTIVE 7

CRITERION-REFERENCED MEASURE

Questions

1. Serial numbers are normally ______________ in a part.
2. Oil changing, filters, and screens are replaced by observing the number of operating ______________.
    a. Days
    b. Temperatures
    c. Hours
    d. Weeks
3. It is important to _________ records and logs so that anyone can see who logged a task on the book.

Answers

1. Engraved
2. c
3. Initial

Practical Application

The student will maintain service records and logs on a piece of farm equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 7 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 7 EVALUATION

MAINTAINING SERVICE RECORDS AND LOGS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained service records and necessary supplies for each piece of equipment.		
2. Checked identification number or equipment description against the records or logs.		
3. Entered both scheduled and unscheduled maintenance performed on each piece of equipment on the appropriate form neatly and accurately. Was sure to enter: a. Maintenance performed. b. Date completed. c. Service life of part replaced (if necessary). d. Date or operating hours for next servicing (such as changing oil, filters, screens, breather, or fluid). e. Initials on service records and logs.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 8

TASK

Order fuel and petroleum supplies for farming operations

STANDARD OF PERFORMANCE OF TASK

The supplies must be ordered in sufficient quantities, as determined by the farming operation and the storage facility available, and delivery must be scheduled.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farming operation in need of fuel
Petroleum supplies

ENABLING OBJECTIVES

1. Identify types of petroleum materials.
2. Identify how much fuel and petroleum a farming operation consumes.

RESOURCE

Tractor Operation and Daily Care. pp. 106-111.

TEACHING ACTIVITIES

1. Demonstrate ability to check fuel tanks and supplies.
2. The student will practice identifying types of fuel and petroleum by texture and color.
3. Discuss the importance and differences in grading petroleum materials.
4. Explain the seasons where fuel is used at a faster rate.
5. Identify the suppliers and jobbers in the petroleum market.
6. Have student complete performance checklist.

PERFORMANCE OBJECTIVE 8 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. What is the acronym for Society of Automotive Engineers?
   a. SAE
   b. OSHA
   c. ASAE
2. __________ is the most combustible fuel.
3. More fuel is used in which season:
   a. Spring
   b. Summer
   c. Fall
   d. Winter

Answers

1. a
2. Gas
3. a

Practical Application

The student will order fuel and petroleum supplies for a farming operation during a planting season.

Method of Evaluating Practical Application

Use Checklist Performance Objective 8 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 8 EVALUATION

ORDERING FUEL AND PETROLEUM SUPPLIES FOR FARMING OPERATION

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Determined and made a list of the following: a. Quantity (gallons, quarts, etc.) of fuel and petroleum supplies needed. b. Type (gasoline, diesel oil, motor oil, grease, etc.) of fuel and petroleum supplies needed.		
2. Identified dates supplies were needed.		
3. Placed order with supplier based on storage facility available.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 9

TASK

Order replacement parts

STANDARD OF PERFORMANCE OF TASK

Requisition form must show the name of supplier, quantity, item description, part number, cost per item, and total cost of replacement parts. Parts ordered for replacement must meet with instructor's specifications, and consideration must be given to the following factors:

1. Cost (initial and long range).
2. Cost of new versus rebuilt parts.
3. Credit allowed for old parts.

Order forms must be 100 percent accurate.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Three pieces of equipment needing replacement parts
Instructions for ordering

ENABLING OBJECTIVES

1. Identify the basic types of agricultural equipment.
2. Locate the model and serial numbers on a given piece of agricultural equipment.

RESOURCE

Jacobs, **Agricultural Power and Machinery**. pp. 264-275.

TEACHING ACTIVITIES

1. Demonstrate the proper use of an inside micrometer.
2. Demonstrate the use of tables to determine if wear is to a point to warrant replacement.

3. Demonstrate the steps in the performance evaluation.
4. Have students read and discuss the textbook, **Agricultural Power and Machinery**, pp. 264-275.
5. Have students complete criterion questions.

PERFORMANCE OBJECTIVE 9

CRITERION-REFERENCED MEASURE

Questions

1. We measure the cylinder wall with:
   a. An outside micrometer
   b. A straight edge
   c. A metric ruler
   d. An inside micrometer.
2. We can save considerable money in some instances by using ______ replacement instead of new parts.
3. When working on any agricultural equipment it is very important to:
   a. Have an owner's manual
   b. Have a knowledge of how it works
   c. Identify the basic parts of an engine
   d. All of the above.

Answers

1. d
2. rebuilt
3. d

Practical Application

Given a piece of equipment needing replacement parts, have students make out a parts list showing the name of the supplier, quantity, item description, part numbers, cost per item and total cost of replacement parts in a 2 hour time allotment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 9 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 9 EVALUATION

ORDERING REPLACEMENT PARTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Determined type and size of replacement parts.		
2. Located source for ordering replacement parts.		
3. Determined cost of replacement parts including: a. Purchase price plus shipping b. Annual cost		
4. Compared prices for parts needing replacement.		
5. Compared cost of rebuilt versus new replacement parts.		
6. Completed necessary requisitions.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 10

TASK

Prepare payroll and mail checks

STANDARD OF PERFORMANCE OF TASK

A payroll for a specified number of employees must be prepared with 100 percent accuracy.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Time worked records for a pay period
Employees' eligible and claimed exemptions
Income and social security tax rates
Deductions for employee benefits
Instructions for calculating gross and net pay

ENABLING OBJECTIVES

1. Use basic math skills.
2. Write a check.

RESOURCE

Federal and State tax deduction tables.

TEACHING ACTIVITIES

1. Show students how to calculate social security deductions.
2. Discuss when overtime on the farm begins.
3. Review the proper way to write a check.
4. Discuss the importance of record keeping for farm labor.
5. Give an example for students to see the proper way to figure time.

PERFORMANCE OBJECTIVE 10

CRITERION-REFERENCED MEASURE

Questions

1. Social Security withholding is calculated by multiplying the salary times __________.
   - a. 12%
   - b. 7.51%
   - c. 10.5%
   - d. 5%
2. Federal and state taxes are different depending on the number of __________ one is entitled.
3. Every worker must have a _______ _____number by law.

Answers

1. b
2. Dependents
3. Social security

Practical Application

Have students prepare payroll and mailing checks.

Method of Evaluating Practical Application

Use Checklist Performance Objective 10 to determine if the assignment was competed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 10 EVALUATION

PREPARING PAYROLL AND MAILING CHECKS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Planned record keeping procedure a. Compiled list of names of employees with social security number. b. Checked time sheets. c. Filed materials in an organized system.		
2. Calculated the number of hours each employee worked.		
3. Calculated gross pay for each employee.		
4. Calculated cost of employee benefits.		
5. Calculated deduction for state, federal, and social security tax.		
6. Reviewed completed forms for accuracy.		
7. Prepared payroll.		
8. Reviewed payroll checks for accuracy.		
9. Mailed the checks.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 11

TASK

Purchase new or used equipment

STANDARD OF PERFORMANCE OF TASK

The purchaser must consider the following factors:

1. Performance of equipment
2. Available capital
3. Age of equipment
4. Operating cost (including downtime cost due to repairs)
5. Equipment life.

The annual cost of owning, maintaining, and operating used equipment must be less than the annual cost of owning and operating new equipment if used equipment is to be purchased. Attending instructor must agree with the student's equipment selection.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A purchase order
Amount of available capital
Three specified pieces of equipment to be purchased

ENABLING OBJECTIVES

1. Identify a sound motor.
2. Select the appropriate H.P. to operate a given piece of equipment.

RESOURCE

New Holland On The Farm, A Buyer's Guide. 1987.

TEACHING ACTIVITIES

1. Go over handout of new equipment.
2. Lecture on the importance of the right horse power to operate equipment.
3. Discuss the sources of capital for purchasing new and used equipment.
4. Discuss the equipment life and depreciation.
5. Demonstrate how to prepare a purchase order.

PERFORMANCE OBJECTIVE 11

CRITERION-REFERENCED MEASURE

Questions

1. The term given to the decreasing value of equipment is _______.
2. Tractor ________ can affect the operating of equipment.
    a. Make
    b. Horse power
    c. Fuel type
    d. None of these.
3. In most businesses, you must have a _____ _____ when buying.
    a. Purchase order
    b. Mastercard
    c. Operator's manual
    d. All of these.

Answers

1. Depreciation
2. b
3. a

Practical Application

Have student model the procedure for purchasing new or used equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 11 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 11 EVALUATION

PURCHASING NEW AND USED EQUIPMENT

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired purchase order, needed capital, and description of equipment needing to be purchased.		
2. Compared prices of new and used equipment.		
3. Decided on the best buy, having considered the above factors.		
4. Prepared purchase order for specified equipment.		
5. Bought equipment.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 12

TASK

Select equipment for specific jobs

STANDARD OF PERFORMANCE OF TASK

Selection of equipment must be made considering the following:

1. Performance capability
2. Operational cost to complete the specific job
3. Appropriateness of equipment for completing specific job
4. Availability of human labor
5. Availability of trained operator for equipment selected.

Attending instructor must agree with the equipment selected.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A list of equipment with the functional aspects of each piece and jobs to be performed

ENABLING OBJECTIVES

1. Read and interpret data.
2. Complete math problems needed in comparing cost and performance capabilities.

RESOURCE

Hunt, **Farm Power and Machinery Management**, pp. 269-288.

TEACHING ACTIVITIES

1. Discuss with students importance of proper equipment selection.
2 Have local farmer speak on equipment selection.
3. Have equipment salesperson speak on equipment selection.
4. Have students survey community to determine equipment available for specific jobs.
5. Instruct students in determining, and give worksheets to be completed by students.
    a. performance capabilities
    b. operational cost
    c. equipment size and attachments.
6. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 12

CRITERION-REFERENCED MEASURE

Questions

1. Repair, maintenance, fuel and oil costs are considered _____ costs.
2. The length of time it would take a machine to do a specific job may be a measure of its ___________.
3. Does one need a different piece of equipment for each different job?

Answers

1. Operational cost
2. Performance capability
3. No, many times an existing piece of equipment may be adapted for other jobs with few changes made.

Practical Application

Have students select equipment for predetermined specific jobs.

Method of Evaluating Practical Application

Use Checklist Performance Objective 12 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 12 EVALUATION

SELECTING EQUIPMENT FOR SPECIFIC JOBS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Identified equipment needed for each specific job.		
2. Determined if equipment was appropriate for specific jobs. a. Performance capability. b. Operational cost. c. Equipment's size and attachments.		
3. Determined labor associated, safety equipment required--first-aid kits, hard hats, etc.		
4. Selected equipment having considered the above factors.		
5. Determined if operator was available to operate selected equipment.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 13

TASK.

Set priorities for ordering equipment

STANDARD OF PERFORMANCE OF TASK

Equipment must be ranked in priority order based on its contribution to the profitability of the farming operation. Factors to be considered are:

1. Increased returns from the equipment from such things as timeliness in getting jobs done, labor saved, and improvement in the quality of the work.
2. Increased costs of owning and operating purchased equipment.
3. Condition and adaptability of existing equipment.
4. Cost and availability of custom work.
5. Opportunities for and returns from doing custom work for others.
6. Annual cost of new versus used equipment.
7. Sizes and types of equipment available (including optional equipment).
8. Available capital.
9. Possibilities of adjusting farming operation to eliminate either the need or increase the need for certain items of equipment.

The priorities established must be approved by the attending instructor.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farming operation in need of equipment

ENABLING OBJECTIVES

1. Read and interpret data.
2. Compute math problems needed in comparing cost and returns.
3. Survey equipment owners and operators.

RESOURCE

Hunt, **Farm Power and Machinery Management**, pp. 269-288.

PERFORMANCE OBJECTIVE 13

TEACHING ACTIVITIES

1. Discuss with students the importance of setting priorities when ordering equipment.
2. Have students visit different farming operations, and survey owners and operators on equipment needs.
3. Have an equipment salesperson speak on topics such as:
   a. Owning vs. leasing
   b. New versus used equipment cost.
4. Review equipment financing with students
5. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Equipment purchases must always be based on its ________________.
2. Why is it not always wise to buy used equipment? ________________
____
3. When should one consider hiring custom work?

Answers

1. Contribution to the profitability of the farming operation.
2. Because of the cost of maintenance and repair of some used equipment.
3. When the size of the farming enterprise does not warrant owning specialized equipment.

Practical Application

Have students set priorities for ordering equipment for a farming operation in need of equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 13 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 13 EVALUATION

SETTING PRIORITIES FOR ORDERING EQUIPMENT

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Determined the type of farming operation.		
2. Identified all equipment needs using input from equipment operators and other farm workers as well as personal knowledge and considered: a. Available capital. b. Size and type of equipment available. c. Increased returns from purchasing equipment. d. Increased cost of owning and operating purchased equipment. e. Condition and adaptability of existing equipment. f. Opportunities for doing custom work. g. Cost and availability of custom work. h. Annual cost of new versus used equipment. i. Possibilities for eliminating the need or increasing the need for equipment.		
3. Determined whether needed equipment was for replacement or new piece of equipment.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 13 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
4. Ranked identified equipment needs in numerical order with number one being the highest priority item, number two being second highest priority item, etc.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 14

TASK

Train employee in the maintenance and servicing of farm equipment

STANDARD OF PERFORMANCE OF TASK

Perform maintenance and service operations according to recommended procedures. When provided a piece of equipment in need of service, the employees will maintain and service the equipment as follows:

1. Check and/or add coolant to radiator
2. Check and/or clean breathers and air filters
3. Change oil and oil filter
4. Check and/or gauge tire pressures
5. Grease equipment
6. Service hydraulic system
7. Check and/or add gasoline to tank
8. Clean and adjust spark plugs
9. Check for worn, broken, or damaged parts.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Farm equipment operator's manual
Tools

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify system of equipment and tools needed in service of equipment.
3. Convey thoughts and ideas to others.

RESOURCES

1. Brickingham, et al. **Machinery Maintenance**, Chapter 3 - 10.
2. Hathaway et al. **Preventative Maintenance, Fundamentals of Machine Operation**, Chapters 2 - 9.

PERFORMANCE OBJECTIVE 14

TEACHING ACTIVITIES

1. Have a manager of a local equipment dealership speak to students on training of employees.
2. Have students review procedures for maintaining and servicing of farm equipment.
3. Stress importance of teaching safety practices.
4. Have students list qualities of a good teacher and use the qualities when training employees.
5. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. What is the easiest way to learn a new skill?
2. What is the purpose of a demonstration?
3. Who is responsible for seeing that employees learn safety?

Answers

1. Do it, practice.
2. To show students exactly what one has talked about or allow students to see what cannot be conveyed with just words.
3. The trainers.

Practical Application

Have students train others in the maintenance and servicing of farm equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 14 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 14 EVALUATION

TRAINING EMPLOYEES IN THE MAINTENANCE AND SERVICING OF FARM EQUIPMENT

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Secured and read operator's manual for each machine to be serviced.		
2. Decided to what extent maintenance and service work on equipment will be done by employees.		
3. Communicated to employees the amount of maintenance and service work they are to do on specific equipment.		
4. Demonstrated or have demonstrated by a qualified person the maintenance and service work to be done on each piece of equipment to employees who will be performing these tasks.		
5. Supervised maintenance and servicing tasks of each employee.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING ROUTINE ADMINISTRATIVE FUNCTIONS

PERFORMANCE OBJECTIVE 15

TASK

Train employees in the operation of farm machinery

STANDARD OF PERFORMANCE OF TASK

Trained employees will follow step-by-step procedures in operating the farm machinery.

1. Check oil, fuel, coolant, and hydraulic fluid for proper levels.
2. Check area around the machinery to insure other individuals are protected during start-up.
3. Place all gears, belts, and PTO in neutral position prior to starting engine.
4. Check machinery for proper positioning and adjustment.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery
Operator's manual
Safety regulations.

ENABLING OBJECTIVES

1. Read and interpret operator's manual and safety regulations.
2. Convey thoughts, ideas, and facts on previous farm machinery operation experience to trainee effectively.

RESOURCE

Tractor Operations Manual.

TEACHING ACTIVITIES

1. Have students demonstrate the following:
    a. Checking oil, fuel, coolant and hydraulic fluid levels
    b. The proper operating procedures for different machines.
2. Have students report on number, type, and cause of farm equipment related accidents in the community.
3. Allow students to have a "mock" training session.
4. Have students prepare bulletin board and handouts on tractor safety.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 15

CRITERION-REFERENCED MEASURE

Questions

1. What is the ultimate cause of accidents? _______________.
2. Why should one always read the operator's manual before operating a different piece of machinery?
3. What industry records the most accident related injuries?

Answers

1. Human error
2. Because all pieces of equipment do not operate the same even if designed for the same job.
3. Agriculture.

Practical Application

Have students train others in the operation of farm machinery.

Method of Evaluating Practical Application

Use Checklist Performance Objective 15 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 15 EVALUATION

TRAINING EMPLOYEES IN OPERATION OF FARM MACHINERY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Obtained and read operator's manual.		
2. Identified skills to be achieved.		
3. Reviewed safety factors to be aware of in operation of equipment under consideration		
4. Became familiar with correct operating procedure(s) of machine(s) under supervision of a qualified operator.		
5. Had employees read operator's manual and safety regulations covering equipment being studied.		
6. Reviewed important information in operator's manual and safety regulations which should be stressed with employees who operate equipment.		
7. Demonstrated to trainees the proper operating procedures for the machine being studied.		
8. Allowed trainees to operate machine under supervision until they can operate it safely, proficiently, and correctly.		
9. Gave additional assistance as needed.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 16

TASK

Change engine oil and filter

STANDARD OF PERFORMANCE OF TASK

The servicing and date must be entered on the appropriate maintenance form with 100 percent accuracy. The tractor engine must run for three minutes with no oil leaks. Oil must be of recommended viscosity grade and classification as identified in operator's manual. Oil level must be at the "full" mark.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 29-36.

CONDITIONS FOR PERFORMANCE OF TASK

A farm tractor
Operator's manual
The necessary supplies
Tools

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify necessary supplies and tools.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**. pp. 46 - 52.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation.** pp. 56 - 67.

TEACHING ACTIVITIES

1. Explain to students the function of engine oil.
2. Explain to students why engine crankcase oil must be changed.
3. Differentiate between the kinds of engine oil.
4. Explain to students the differences that exist between types of oil filters and types of filtration systems.
5. Demonstrate to students the proper procedure for entering data on appropriate maintenance forms.
6. Show students how to use needed tools.

PERFORMANCE OBJECTIVE 16

CRITERION-REFERENCED MEASURE

Questions

1. Which of the items below is not a function of the oil system?
    a. Reduce friction between moving parts
    b. Help cool the engine
    c. Increase engine horsepower
    d. Seal between piston rings and cylinder walls
    e. Clean engine parts
2. __________ oils are recommended for gasoline engines and ______ oils are recommended for diesel engines.
3. Why should the oil filter be changed each time the engine oil is changed?

Answers

1. c
2. SF - oil for gasoline engines
   CD - oil for diesel engines
3. Used oil filters contain dust and dirt which will not allow proper filtering.

Practical Application

Have students change engine oil and filter and record data on the appropriate maintenance form.

Method of Evaluating Practical Application

Use Checklist Performance Objective 16 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 16 EVALUATION

CHANGING ENGINE OIL AND FILTER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Gathered needed tools and equipment. a. Wrench for drain plug. b. Clean rags. c. New oil of grade and type recommended in tractor operator's manual. d. Container for old oil. e. Oil filter wrench. f. Oil filter cartridge.		
2. Ran tractor until it reached normal operating temperature.		
3. Removed drain plug. Drained crankcase completely. Removed oil filter. If spin on type, cleaned filter base and installed new filter (hand tightened only). If cartridge type: a. Cleaned dirt from around filter cartridge. b. Removed drain plug from around filter base. NOTE: Not all filters are equipped with drain plug. c. Loosened and removed filter bowl or cover. d. Removed old filter element. e. Cleaned inside of filter and base with kerosene or diesel fuel. f. Replaced filter element. g. Applied light grease film to new gasket. h. Installed new gasket.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 16 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
i. Replaced and tightened filter bowl or cover. j. Replaced and tightened drain plug around filter base.		
4. Replaced drain plug in crankcase.		
5. Refilled crankcase with recommended oil.		
6. Started engine and operated for a few minutes at a low RPM.		
7. Checked oil pressure gauge to make sure that the oil pump was working.		
8. Checked oil leaks around the plug and filter.		
9. Checked oil level with dipstick, fill to "full" mark. DO NOT OVER FILL.		
10. Entered service data on records.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 17

TASK

Change hydraulic fluid in hydraulic reservoir

STANDARD OF PERFORMANCE OF TASK

The servicing date must be entered on the appropriate form with 100 percent accuracy and there shall be no leaks. System must be serviced with the type and weight of hydraulic fluid recommended for the equipment and should be free of trapped air.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with hydraulic reservoir
Operator's manual
Necessary equipment
Clean rags
Container for old fluid
Proper replacement fluid

ENABLING OBJECTIVES

1. Read and interpret operator's manual and observe safety procedures.
2. Identify hydraulic reservoir and necessary equipment.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**. pp. 94-103.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, PP. 144-161.

TEACHING ACTIVITIES

1. Explain to students the functions of the hydraulic system.
2. Identify the parts of the hydraulic system on a tractor.
3. Identify the major enemies of hydraulic systems.
4. Demonstrate the proper procedure for checking for leaks.
5. Demonstrate the use of a "hydraulic tester".

CRITERION-REFERENCED MEASURE

Questions

1. Hydraulic fluid can be contaminated by ____________________ in the same way as in the engine crankcase.
2. What is the number one enemy of hydraulic systems? ____________
3. Where should one determine if the engine should be running while checking hydraulic oil level? _________.

PERFORMANCE OBJECTIVE 17

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Oil
2. Dirt
3. Operator's manual

Practical Application

Have students change hydraulic fluid in hydraulic reservoir and enter servicing date on appropriate form.

Method of Evaluating Practical Application

Use Checklist Performance Objective 17 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 17 EVALUATION

CHANGING HYDRAULIC FLUID IN HYDRAULIC RESERVOIR

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read manual to determine correct procedure.		
2. Removed drain plug and gasket (if there is one) and clean.		
3. Drained oil into container; replacing plug.		
4. Refilled system with clean hydraulic fluid of recommended type.		
5. Operated system to check for leaks or trapped air.		
6. Entered service data on records.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 18

TASK

Check tire pressure

STANDARD OF PERFORMANCE OF TASK

Tire air pressure must be within one pound per square inch of the manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 39-41.

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with pneumatic tires
Tire air pressure gauge
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Operate and interpret air pressure gauge.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 106-109.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation.** pp. 182-184.

TEACHING ACTIVITIES

1. Explain to students the importance of proper tire pressure.
2. Have students identify tires which have been driven over-inflated and which are under-inflated.
3. Review the reasons for checking and inflating tires when they are cold.
4. Explain the differences between high-pressure and low-pressure air gauges.
5. Review with students the proper reading of air pressure gauges.

PERFORMANCE OBJECTIVE 18

CRITERION-REFERENCED MEASURE

Questions

1. Over-inflated tires will wear away the center of the tire or the edges. ____________________.
2. A tire with worn edges but with a good center tread has been __________
3. Air pressure in tires should be checked when the tractor tires are ____________________.

Answers

1. Center
2. Under-inflated
3. Cold

Practical Application

Have students check tire pressure and inflate or deflate to the manufacturer's specifications.

Method of Evaluating Practical Application

Use Checklist Performance Objective 18 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 18 EVALUATION

CHECKING TIRE PRESSURE

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained tire air pressure gauge and operator's manual.		
2. Removed valve stem cap.		
3. Checked tire air pressure. a. If tire pressure was low, inflated pressure to manufacturer's specifications.		
4. Checked valve stem for leaks.		
5. Checked tire, rim and valve stem for damage and wear.		
6. Replaced valve stem cap.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 19

TASK

Lubricate and grease chassis fittings

STANDARD OF PERFORMANCE OF TASK

Using three pieces of equipment, lubricate fitting until fresh grease appears around the seal, and excess grease is removed from component.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 5, 27.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor and two pieces of farm machinery
Manufacturer's lubrication chart for the appropriate machinery
Grease gun
Proper lubricant
Clean rags

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Use a grease gun.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance,** p. 112.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation,** pp. 188-189.

TEACHING ACTIVITIES

1. Review the importance of keeping bearings lubricated.
2. Review the method of filling grease gun with grease and proper operation.
3. Give students practice problems on selecting proper lubricant.
4. With instructor's given information, give the students a partially filled-out manufacturer's lubrication chart and allow students to complete.
5. Demonstrate the effects of dirt on bearings and fittings.

PERFORMANCE OBJECTIVE 19

CRITERION-REFERENCED MEASURE (Continued)

Questions

1. All grease fittings should not be serviced at the same ___________.
2. One should grease machine parts when equipment is to be used for longer than _________hours.
3. What reference would one use to determine proper lubricant and lubricating intervals?

Answers

1. Intervals
2. Two
3. Operator's manual.

Practical Application

Have students lubricate and grease chassis fittings and record needed information in operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 19 to determine if the assignment was completed with 100% accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 19 EVALUATION

LUBRICATING AND GREASING CHASSIS FILLINGS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Gathered needed tools and supplies.		
2. Identified all lubrication points for each piece of farm machinery.		
3. Checked manufacturer's lubrication chart for proper lube specifications.		
4. Removed dirt and excess lubrication from each lube fitting with clean rags.		
5. Attached grease gun nozzle to the lube fitting and fill joint with fresh grease. Applied grease to fitting until fresh grease appears around the seal. Did not over grease as this: a. Destroys seals and packings. b. Reduces life of the machine part.		
6. Insured that all lubrication points are filled with fresh grease.		
7. Removed excessive grease from component area with clean rags.		
8. Disposed of soiled rags in the proper container.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 19 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
9. Cleaned and replaced all tools, unused lubricant, and lube identification chart to their proper storage areas.		
10. Recorded date of lubrication on proper chart.		

APPROVED: YES _____ NO ____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 20

TASK

Prepare farm machinery for storage

STANDARD OF PERFORMANCE OF TASK

Prepare machine for storage according to operator's manual directions. All dirt, grease, and dust must be removed. Rusted areas must be treated and painted with preservative. Attending instructor must agree that the machinery has been properly prepared for storage.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farm machine in good repair
Operator's manual
Equipment and supplies

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Select necessary supplies and equipment.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 133-134.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 217-218.

TEACHING ACTIVITIES

1. Demonstrate the proper use of cleaning equipment and supplies.
2. Review the procedure for checking antifreeze protection of coolant.
3. Review the use of rust inhibitor in fuel tanks and other appropriate reservoirs.
4. Review the proper removal of and storage of battery.
5. Review the proper lubrication and other needed procedures for preparing farm machinery for storage.

PERFORMANCE OBJECTIVE (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. Why should fuel be drained from tanks?
2. Why should tires be removed or raised off of ground?
3. __________ _________ may be damaged when the machine is not being used.

Answers

1. To prevent rusting of tank from condensed water.
2. To prevent tires from dry-rotting.
3. Engine components

Practical Application

Have students prepare farm machinery for storage.

Method of Evaluating Practical Application

Use Checklist Performance Objective 20 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 20 EVALUATION

PREPARING FARM MACHINERY FOR STORAGE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual to determine procedures for storage.		
2. Gathered necessary supplies and equipment.		
3. Followed directions in manual and prepared farm machinery for storage.		
4. Repaired rusted areas.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 21

TASK

Prepare farm machinery for use after storage

STANDARD OF PERFORMANCE OF TASK

All preservatives must be removed and machinery must be safe for operational performance as specified in the operator's manual. Attending instructor must agree that the machinery is operationally safe.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Pinciples and Procedures, pp. 145-147.

CONDITIONS FOR PERFORMANCE OF TASK

A farm machine in good repair
Operator's manual
Necessary equipment and supplies

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Select and identify necessary equipment and supplies.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**, p. 134
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, p. 218

TEACHING ACTIVITIES

1. Review procedures used in preparing machinery for storage.
2. Ask students to develop checklist from operator's manual.
3. Review with students proper handling of fuels and equipment.
4. Review with students proper procedure for checking for leaks.
5. Instruct students on methods of troubleshooting.

CRITERION-REFERENCED MEASURE

Questions

1. ____________ machinery should be prepared for use after storage.
2. Why should preparation of machinery for use after storage be done a couple of weeks before machinery is needed?
3. Does motorized machinery need to be serviced after storage?

PERFORMANCE OBJECTIVE 21

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Motorized
2. Time may be needed to make repairs.
3. Yes

Practical Application

Have students prepare a piece of farm machinery for use after storage.

Method of Evaluating Practical Application

Use Checklist Performance Objective 21 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 21 EVALUATION

PREPARING FARM MACHINERY FOR USE AFTER STORAGE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual to determine procedures for preparing farm machinery for use after storage.		
2. Gathered necessary supplies and equipment.		
3. Noted two types of machinery in relation to care procedure: a. Motorized machinery. (1) Checked and cleaned carburetor. (2) Checked oil level. (3) Checked transmission fluid level. (4) Checked air pressure of tires. (5) Checked all moving parts for tightness. (6) Filled fuel tank. (7) Checked air cleaner, battery, and ignition system. b. Non-motorized machinery. (1) Checked tire pressure. (2) Checked moving parts. (3) Checked hydraulics and hoses.		
4. Adjusted machinery for operation.		
5. Operated the machinery.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 22

TASK

Repack front wheel bearings

STANDARD OF PERFORMANCE OF TASK

Bearing must be properly packed with the recommended lubricant. Bearing must be torqued to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 114-119.

CONDITIONS FOR PERFORMANCE OF TASK

A farm tractor
Mechanic's tool set
No. 2 lithium grease
Shop rags

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Use a torque wrench properly.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**. p. 111.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 171-176.

TEACHING ACTIVITIES

1. Lecture on the importance of cleaning and repacking wheel bearings.
2. Instruct and demonstrate OSHA jacking procedures.
3. Teach the identification of equipment and needed parts.
4. Allow students to examine damaged bearings, grease seals and retainers.
5. Stress to students the importance of keeping dirt and dust off of hands, bearings and equipment while repacking wheel bearings.

CRITERION-REFERENCED MEASURE

Questions

1. Why should one never use concrete blocks to support the machine?
2. What is one of the biggest enemies of bearings? __________
3. How does one determine what type of grease to use when repacking wheel bearings?

PERFORMANCE OBJECTIVE 22

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Because they crack and fall apart easily.
2. Dirt
3. Check operator's manual.

Practical Application

Have students repack front wheel bearings.

Method of Evaluating Practical Application

Use Checklist Performance Objective 22 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 22 EVALUATION

REPACKING FRONT WHEEL BEARINGS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Locked brakes; raised and blocked up the front end. (NOTE: Both manufacturer and OSHA jacking procedures must be followed).		
2. Removed hub cap, cotter pin, adjusting nut, thrust washer, and outer bearing cone.		
3. Pulled off the wheel hub containing bearing cups cone and outer half of seal.		
4. Removed the inner half of seal from the spindle.		
5. Removed the inner cone, bearing cups, and outer seal half from the hub.		
6. Cleaned all parts thoroughly.		
7. Inspected bearing cups and cones for wear or damage. Replaced if necessary.		
8. Packed each bearing with No. 2 lithium grease. Filled the space around each roller.		
9. Installed bearing cups, inner bearing cone, and new outer seal.		
10. Installed new inner seal half onto the spindle with the curved face inward.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 22 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
11. Lubricated the seal surfaces with No. 2 lithium grease.		
12. Installed outer cone into the hub.		
13. Installed hub assembly onto the spindle.		
14. Installed the thrust washer and adjusting nut. Tightened nut against thrust washer until the pressure causes a drag while the hub and wheel are turned. Torqued according to specifications. Backed off the nut until the next slot in the nut lines up. If any end play was noticed, tightened the nut.		
15. Locked the slotted adjusting nut with a new cotter pin and reinstalled the hub cap.		
16. Lowered front end of tractor.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 23

TASK

Replace diesel fuel filters

STANDARD OF PERFORMANCE OF TASK

Fuel filter must be replaced with new element taking care that air is bled from all fuel lines. Engine must start and run at full idle for three minutes with no fuel leak.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp 11-114.

CONDITIONS FOR PERFORMANCE OF TASK

A diesel tractor
Proper tools
Materials

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify fuel filter.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance,** pp. 32-44.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 30-54

TEACHING ACTIVITIES

1. Lecture on the types of fuel systems.
2. Lecture on the importance of maintaining clean fuel systems.
3. Instruct students on the proper procedure of bleeding air from fuel system after service.
4. Review with students the needed tool identification as well as fuel system parts.
5. Instruct students on the proper handling of new and used fuel filters.

PERFORMANCE OBJECTIVE 23 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. A diesel engine may have one or two fuel filters that one should be concerned with changing or replacing.
2. What is the purpose of fuel filters?
3. How does one determine when to change or replace fuel filters?

Answers

1. Two
2. To remove damaging rust, dirt and water from the fuel.
3. Check operator's manual.

Practical Application

Have students replace diesel fuel filters.

Method of Evaluating Practical Application

Use Checklist Performance Objective 23 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 23 EVALUATION

REPLACING DIESEL FUEL FILTERS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual.		
2. Selected proper tools and cleaning materials.		
3. Turned off fuel supply.		
4. Cleaned outside of filter.		
5. Cleaned engine area around filter.		
6. Drained fuel from filter.		
7. Removed old filter element.		
8. Cleaned inside of filter bowl.		
9. Installed new filter element.		
10. Tightened filter assembly.		
11. Replaced drain plug.		
12. Turned on fuel supply and bled lines.		
13. Started tractor, ran for three minutes, and checked for leaks.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 24

TASK

Replace filters, screens, and breathers on hydraulic systems

STANDARD OF PERFORMANCE OF TASK

The system must have no leaks and be free of trapped air. All systems must operate in safe and normal manner. Servicing date and nomenclature must be entered on the appropriate maintenance form with 100 percent accuracy.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 140-142.

CONDITIONS FOR PERFORMANCE OF TASK

A hydraulic system with dirty filters
Screens
Breathers

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify filters, screens, and breathers on hydraulic systems.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**. pp. 94-103.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machinery Maintenance**, pp. 144-164.

TEACHING ACTIVITIES

1. Explain the importance of servicing hydraulic systems.
2. Review with students the needed tool identification and identification of hydraulic system parts.
3. Review with students the correct procedure for checking and adding hydraulic oil.
4. Review with students the main enemies of hydraulic systems.
5. Explain the nomenclature used on maintenance form and give students an example of an up-to-date maintenance form.

PERFORMANCE OBJECTIVE 24

CRITERION-REFERENCED MEASURE

Questions

1. What will happen if hydraulic filters are not changed at recommended intervals?
2. What are the four main enemies of a hydraulic system?
3. Hydraulic oil does need to be changed each time _________ are changed.

Answers

1. Filters will become full of dirt, rust, and metal particles and will allow dirty oil to be pumped through the system.
2. a Low oil level
   b. Dirt
   c. Leaks
   d. Incorrect oil
3. Filters

Practical Application

Have students replace filters, screens, and breathers on a tractor with a hydraulic system.

Method of Evaluating Practical Application

Use Checklist Performance Objective 24 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 24 EVALUATION

REPLACING FILTERS, SCREENS, AND BREATHERS ON HYDRAULIC SYSTEMS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read manual to determine procedures and materials needed.		
2. Gathered needed replacements and tools.		
3. Drained hydraulic system into container.		
4. Removed filters, screens, and breathers.		
5. Replaced filters, screens, and breathers.		
6. Refilled hydraulic system and bled entrapped air.		
7. Checked system for normal operation.		
8. Entered servicing date and nomenclature on the appropriate maintenance form.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 25

TASK

Replace front wheel bearing and grease seal

STANDARD OF PERFORMANCE OF TASK

Bearing must be packed with fresh grease. Grease seal must be seated, and bearing must be torqued to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 118-119.

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery
Necessary tools
Shop rags
Replacement part
NO. 2 lithium grease
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify necessary tools and replacement parts needed to replace front wheel bearing and seal.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**, p. 111.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 171-175.

TEACHING ACTIVITIES

1. Instruct students in OSHA jacking procedures.
2. Review the parts identification.
3. Demonstrate the proper use of torque wrench.
4. Lecture on the reasons for replacing front wheel bearing and grease seal.
5. Review with students the enemies of wheel bearings.

CRITERION-REFERENCED MEASURE

Questions

1. What is one of the biggest enemies of bearings? __________
2. Why should one never use concrete blocks to support the machine?
3. If one ______________ is found defective, all should be replaced.

PERFORMANCE OBJECTIVE 25

CRITERION-REFERENCED MEASURE (continued)

Answers

1. Dirt (another - water)
2. Because they crack and fall apart easily.
3. Bearing

Practical Application

Have students replace front wheel bearing and grease seal.

Method of Evaluating Practical Application

Use Checklist Performance Objective 25 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 25 EVALUATION

REPLACING FRONT WHEEL BEARING AND SEAL

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained replacement parts, shop rags, necessary tools, No. 2 lithium grease and operator's manual.		
2. Locked brakes; jack front wheel of the vehicle off the ground, and provided proper support. (NOTE: Both manufacturer's and OSHA jacking procedures must be followed).		
3. Removed wheel bearing dust cap.		
4. Removed cotter pin, adjusting nut, thrust washer, and outer bearing cone.		
5. Removed wheel from spindle.		
6. Removed outer wheel bearing and grease seal. (NOTE: Outer grease seal must be removed before bearing. Care should be taken when "driving" the seal out so the face is not scratched).		
7. Inspected bearing cups and cones for wear or damage. Replaced, if necessary.		
8. Packed both inner and outer bearing with No. 2 lithium grease. Filled the space around each roller.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 25 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
9. Installed inner bearing cone and new outer rear grease seal half edge in 3/16 inch below the inner hub face. (NOTE: If old bearing cup was worn or damaged, it should also be replaced).		
10. Installed new inner seal half onto the spindle with the curved face inward.		
11. Lubricated the seal surfaces with No. 2 lithium grease.		
12. Installed outer cone into the hub.		
13. Installed hub assembly onto the spindle.		
14. Installed the thrust washer and adjusting nut. Tightened nut against thrust washer until the pressure causes a drag while the hub and wheel is turned. Torqued according to specifications. Basked off the nut until the next slot in the nut lines up with the hole in the spindle.		
15. Locked the slotted adjusting nut with a new cotter pin and reinstalled the dust cap and hub cap.		
16. Lowered front end of tractor and removed jack.		

APPROVED: YES ____ NO ____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 26

TASK

Replace points, rotor and condenser

STANDARD OF PERFORMANCE OF TASK

Rotor and condenser must be properly positioned and fastened securely. Point gap setting should be 100 percent accurate as specified in operator's manual.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 96-99.

CONDITIONS FOR PERFORMANCE OF TASK

Points
Rotor
Condenser
Operator's manual
Feeler gauge
Dwell meter
Ignition wrench set

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify needed parts and equipment.

RESOURCES

1. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 110-118.
2. **Fundamentals of Service: Electrical Systems** pp. 6-6 to 6-16.

TEACHING ACTIVITIES

1. Review the identification of parts and needed equipment.
2. Lecture on the functions of points, rotors and condensers.
3. Explain the reasons for replacing points, rotors and condensor.
4. Demonstrate the use of feeler gauge and dwell meter.
5. Allow students to view a machine with points, rotor and condenser properly installed.

PERFORMANCE OBJECTIVE 26

CRITERION-REFERENCED MEASURE

Questions

1. The ______ is used to check the cam angle so that the point gap may be set.
2. What is responsible for preventing excessive arcing between the points and responsible for causing the magnetic field to collapse quickly?

   ____
3. An engine will "run" even though the ________ is not correct.

Answers

1. Dwell meter
2. Condenser
3. Point gap.

Practical Application

Have students replace points, rotor and condenser on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 26 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 26 EVALUATION

REPLACING POINTS, ROTOR AND CONDENSER

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Referred to operator's manual for specifications.		
2. Removed distributor cap.		
3. Removed rotor.		
4. Removed breaker arm and spring.		
5. Removed stationary breaker point bracket.		
6. Cleaned, then lubricated cam with petroleum jelly or multipurpose grease.		
7. Replaced condenser.		
8. Installed new points in reverse order of the procedure used to disassemble.		
9. Replaced rotor.		
10. Set breaker points using a feeler gauge; checked with dwell meter.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 27

TASK

Replace distributor cap

STANDARD OF PERFORMANCE OF TASK

Plug wires should be inserted in the proper distributor cap terminal. Tractor must start and run with no engine miss.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. p. 99.

CONDITIONS FOR PERFORMANCE OF TASK

A farm tractor with a cracked distributor cap
Operator's manual
Replacement distributor cap
Necessary tools

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify and locate distributor cap.

RESOURCES

1. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 109-120.
2. **Fundamentals of Service: Electrical Systems**, p. 6-12.

TEACHING ACTIVITIES

1. Review the identification of distributor parts.
2. Lecture on the purpose of the distributor and distributor cap.
3. Explain why a cracked distributor cap must be replaced.
4. Exhibit to students a cracked distributor cap.
5. Explain what is meant by "firing order".

CRITERION-REFERENCED MEASURE

Questions

1. Why should one never clean a distributor cap with water?
2. How should one determine the correct firing order? ____________.
3. Why must cracked distributor caps be replaced?

PERFORMANCE OBJECTIVE 27

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Because water left in the distributor cap could cause a short or crossfiring during operation.
2. Operator's manual.
3. A crack in the distributor cap allows moisture to enter causing crossfiring during operation.

Practical Application

Have students replace a cracked distributor cap on a farm tractor with a new one.

Method of Evaluating Practical Application

Use Checklist Performance Objective 27 to determine if the assignment was completed with 100% accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 27 EVALUATION

REPLACING A DISTRIBUTOR CAP

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools and appropriate operator's manual.		
2. Disconnected distributor cap from distributor housing.		
3. Removed spark plug wires from cracked distributor cap, cleaned ends of wires, and inserted into proper terminal on new distributor cap. (NOTE: Operator's manual will provide an illustration of correct firing order).		
4. Inserted new distributor cap on distributor housing and secured. (NOTE: Be sure distributor cap is properly seated as a "mis-seat" will break the rotor).		
5. Started engine and checked that all cylinders are firing properly.		

APPROVED: YES ____ NO ____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 28

TASK

Replace radiator and heater hoses

STANDARD OF PERFORMANCE OF TASK

All radiator and heater hoses needing replacement must be replaced. There must be no coolant leak(s) when engine is brought to normal operating temperature when replacing the defective and heater hoses in accordance with the manufacturer's procedures.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with defective radiator heater hoses
Appropriate tools
Equipment
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify and locate radiators and heater hoses.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**. pp. 68-65.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 72-85.

TEACHING ACTIVITIES

1. Review with students the identification of engine cooling parts.
2. Explain the operation of the cooling system.
3. Place on display damaged and/or weakened hoses.
4. Identify the dangers of not replacing defective hoses.
5. Instruct students in selection of and checking of antifreeze solutions.

PERFORMANCE OBJECTIVE 28

CRITERION-REFERENCED MEASURE

Questions

1. The cooling system absorbs about ________ of the heat energy developed by the engine fuel.
   a. 45
   b. 1/10
   c. 1/3
   d. 1/2
2. Hoses need replacing at the time a ____________ is found.
3. What instrument is used to test the freezing protection of anti-freeze?

Answers

1. 1/3 of the heat energy developed by the engine fuel is absorbed by the cooling system.
2. Leak
3. Hydrometer

Practical Application

Have students replace defective radiator and heater hoses.

Method of Evaluating Practical Application

Use Checklist Performance Objective 28 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 28 EVALUATION

REPLACING RADIATOR AND HEATER HOSES

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Drained cooling system below heater hose level. (NOTE: Be sure engine is cool).		
2. Removed hose clamps at each end of the identified, defective hoses.		
3. Grasped hose at connecting point and with a twisting motion removed hose from connection. (NOTE: It may be necessary in some cases to split or cut hose with a knife in order to accomplish the removal).		
4. Inspected all connecting points to see that they are clean and free of any foreign matter such as old hose or gasket sealer.		
5. Installed new hoses using new hose clamps where needed.		
6. Filled system with coolant bringing it to proper level.		
7. Bled heater and hoses. (This is accomplished by disconnecting the topmost heater hose at its highest point and allowing coolant to flow through both disconnected points).		

CHECKLIST FOR PERFORMANCE OBJECTIVE 28 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
8. Brought system to normal operating temperature; pressure tested system checking for leaks and for operation.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 29

TASK

Replace spark plugs

STANDARD OF PERFORMANCE OF TASK

All plugs must be replaced and the gap set to 100 percent accuracy as specified in operator's manual. Spark plug wires must be connected so that the proper firing order is maintained.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 61-63.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Supplies

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Follow a firing order diagram and use wire gauge to adjust gap of spark plugs.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**, pp. 79.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 105-109.

TEACHING ACTIVITIES

1. Review with students the function of spark plugs.
2. Explain why spark plugs must be replaced.
3. Demonstrate the proper use of wire gauge to adjust spark plug gap.
4. Illustrate the importance of adjusting spark plug gap to recommend spacing by installing spark plug with incorrect gap in engine.
5. Go over with students a "spark plug condition chart" which will help in determining cause of condition of spark plug.

PERFORMANCE OBJECTIVE 29

CRITERION-REFERENCED MEASURE

Questions

1. Spark plugs are different because you have ________ plugs and ________ plugs.
2. Some spark plugs come with the gap preset at the factory.
3. How many spark plugs will an eight cylinder diesel engine have? ________

Answers

1. Hot, cold
2. True
3. None

Practical Application

Have students replace spark plugs.

Method of Evaluating Practical Application

Use Checklist Performance Objective 29 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 29 EVALUATION

REPLACING SPARK PLUGS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual for replacing plugs.		
2. Brushed dirt from around spark plug hole.		
3. Removed the plug using an appropriate size wrench. Checked plug for cracked insulator and other signs of damage.		
4. Adjusted plugs' gap to manufacturer's recommendation using a round or wire gauge.		
5. Installed new plugs.		
6. Test ran engine and checked plug operation.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 30

TASK

Replace V-belts

STANDARD OF PERFORMANCE OF TASK

V-belt must be adjusted to the tension as specified in the operator's manual.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Service manual
Tools
Equipment

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify V-belts.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**, pp. 113-114.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 190-192.

TEACHING ACTIVITIES

1. Lecture on V-belt usage and importance of V-belt maintenance.
2. Demonstrate the proper use of strand belt gauge and other means of checking belt tension.
3. Demonstrate how to check alignment of belt sheaves and explain importance of proper sheave alignment.
4. Place on display damaged belts and label each belt with cause of damage.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 30

CRITERION-REFERENCED MEASURE

Questions

1. Which will cause the V-belt to slip or slip-and grab, causing the belt to break? Too little tension or too much tension.
2. When installing V-belts, a flat-head screw driver should not be used to assist in forcing the belt on the sheave . Why?
3. What may be the result of too much belt tension?

Answers

1. Too little tension
2. Never force a V-belt onto a sheave.
3. Belt heating, excessive stretch as well as damage to drive components.

Practical Application

Have students remove and replace V-belts.

Method of Evaluating Application

Use Checklist Performance Objective 30 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 30 EVALUATION

REPLACING V-BELTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tool, V-belt, and service manual.		
2. Loosened cap screw or bolt controlling belt tension.		
3. Loosened alternator mounting bolts slightly (if necessary).		
4. Moved alternator toward engine. (Care must be taken not to damage the alternator).		
5. Removed V-belt.		
6. Installed new V-belt.		
7. Moved alternator outward until proper tension was obtained.		
8. Tightened cap screw or bolt controlling belt tension at top of alternator.		
9. Tightened alternator mounting bolts.		
10. Rechecked belt tension with Strand Belt Gauge or other suitable gauge.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 31

TASK.

Service air cleaner (dry type or paper cleaner)

STANDARD OF PERFORMANCE OF TASK

Check for restrictions or accumulation of dust and clean the air according to manufacturer's recommendations.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 21-25.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Necessary equipment
Instructions

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify air cleaner.

RESOURCES

1. Buckingham et al., **Machinery Maintenance**, pp. 22-24.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 9-16.

TEACHING ACTIVITIES

1. Explain the function of air cleaners and importance of service to students.
2. Lecture to students on the types of air cleaners, principles of operation of each type.
3. Review with students the hazards of using compressed air to clean air cleaners.
4. Identify dust unloader and demonstrate its use.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 31

CRITERION-REFERENCED MEASURE

Questions

1. How does one know when to service an engine air cleaner?
2. Engines shall not run a short period with dirty or clogged cleaners or without an air cleaner. Why?
3. Why should one use care when cleaning paper type filters with compressed air?

Answers

1. Check operator's manual
2. Dirty or clogged cleaners do not filter the air. Any air entering the engine unfiltered, may cause damage because of the dust it contains.
3. Compressed air may damage filters by blowing holes in the paper.

Practical Application

Have students service air cleaners (dry type or paper cleaner).

Method of Evaluating Practical Application

Use Checklist Performance Objective 31 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 31 EVALUATION

CLEANING DRY OR PAPER AIR CLEANER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfacto**
1. Referred to operator's manual for information relating to specific machine.		
2. Checked to see that unloader is not blocked by obstruction.		
3. Removed hood or grill, if necessary, to provide access to air cleaner.		
4. Wiped off dust accumulated around end of cleaner where element will be removed.		
5. Loosened hand screw or clamp that holds the end of cap on the end of the cleaner.		
6. Emptied cup, wiped out dust, and replaced cap.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 32

TASK

Service air cleaner (oil-bath type)

STANDARD OF PERFORMANCE OF TASK

There must be no sediment accumulation in the air cleaner bowl when completing this maintenance and "fill " must be at the oil level mark, not above.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 133-134.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Necessary equipment

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify air cleaner and differentiate between dry type or paper cleaners and oil-bath air cleaners.

RESOURCES

1. Buckingham, et al., **Machinery Maintenance**, pp. 22-24.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 9-16.

TEACHING ACTIVITIES

1. Explain to students the function of air cleaners and importance of service.
2. Discuss with students the principal of operation of an oil-bath air cleaner.
3. Review with students the proper handling and storage of both new and used oil.
4. Identify the pathway of air going to engine, reviewing identification of all parts involved.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 32

CRITERION-REFERENCED MEASURE

Questions

1. Thickened oil should be changed, even though the dirt may not be at the recommended depth for changing, because ______________.
2. Just any oil shall not be used in the oil cup of an oil-bath air cleaner. Why?
3. Why should one not over fill oil cup?

Answers

1. Thickened oil acts as a choke and will cause the engine to use more fuel.
2. Most operator's manuals recommend the same weight as used in the engine crank case.
3. Oil may spill over into carburetor.

Practical Application

Have students service an oil-bath air cleaner.

Method of Evaluating Practical Application

Use Checklist Performance Objective 32 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 32 EVALUATION

SERVICING OIL-BATH TYPE AIR CLEANERS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Loosened oil cup and removed from filter.		
2. Checked depth of sediment deposit in outer chamber. If sediment in outer chamber is 1/2 inch in depth, proceeded with remaining steps. (Some manufacturers recommend changing oil if sediment is 1/4 inch thick).		
3. If cup needed cleaning, threw away dirty oil; scraped then washed inner and outer cups and cleaned with kerosene, mineral spirits or diesel fuel.		
4. Checked air-intake pipe (air stack) for dirt accumulation.		
5. Refilled cup with fresh oil to "full" mark.		
6. Replaced oil cup (and screen tray, if included) and tightened clamp.		
7. Checked air duct between cleaner and carburetor (or intake manifold on diesel engines) for holes or loose clamp connections.		
8. Replaced defective air ducts.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 32 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
9. Checked air inlet screen, or pre-cleaner, and removed trash if necessary.		

APPROVED: YES _____ NO ____

Evaluator's Signature   Date

DUTY PERFORMING SCHEDULED FARM EQUIPMENT MAINTENANCE

PERFORMANCE OBJECTIVE 33

TASK

Service breathers for oil reservoir

STANDARD OF PERFORMANCE OF TASK

Oil reservoir breathers must be clean. Oil level must be at "full" level line, and reservoir sealed to prevent oil leakage.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor equipped with oil reservoirs
Operator's manual
Cleaning solution
Tools
Oil compressor

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedure.
2. Identify breathers for oil reservoir.

RESOURCE

Tractor Maintenance: Principles and Procedures, pp. 36-39.

TEACHING ACTIVITIES

1. Discuss with students principles of operation of breathers for oil reservoir.
2. Explain importance of breather service.
3. Review with students safe use of air compressor.
4. Have students identify cleaning solutions and tools.
5. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Oil breathers serve two main purposes. These are: ______________________ ______________________ & ______________________
2. Why is wire mesh sprayed with engine oil? ______________________
3. List one safety precaution that should be observed when using an air compressor.

PERFORMANCE OBJECTIVE 33

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. To avoid a buildup of pressure; to remove gases and vapors
2. The oil is used to collect dust and dirt.
3. Wear eye protection

Practical Application

Have students service oil breathers for oil reservoir.

Method of Evaluating Practical Application

Use Checklist Performance Objective 33 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 33 EVALUATION

SERVICING BREATHERS FOR OIL RESERVOIR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Located oil reservoir breathers using operator's manual.		
2. Removed breathers and washed in cleaning solution.		
3. Blew breathers dry using compressed air.		
4. Sprayed wire mesh in breather with 1OW engine oil.		
5. Replaced breathers in its original position.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 34

TASK

Service filters, screens, and breathers on hydraulic systems

STANDARD OF PERFORMANCE OF TASK

The filters, screens, and breathers must be free of grit, cleaned, and sealed to prevent leakage of hydraulic fluid.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 138-142.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor equipped with a hydraulic system
Filters
Tools
Air compressor
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify filters, screens, and breathers on hydraulic system .

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 94-103
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 144-161.

TEACHING ACTIVITIES

1. Review the importance of hydraulic system maintenance.
2. Ask students to identify hydraulic system filters, screens and breathers.
3. Review the procedures for washing screens and breathers in solvent and review safe use of air compressor.
4. Stress the importance of cleanliness when working on hydraulic system.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 34

CRITERION-REFERENCED MEASURE

Questions

1. What are the four basic enemies that attack hydraulic systems?
   ______________ ______________ __________________ ______________.
2. Why should one wear safety glasses and wear protective clothing when checking for hydraulic leaks?
3. If one has trouble locating screens, filters and breathers, what should one do?

Answers

1. Low oil level, dirt, leaks and incorrect oil
2. Because pressurized hydraulic oil can pierce your skin and poison you.
3. Look in operator's manual.

Practical Application

Have students service filters, screens, and breathers on a hydraulic system.

Method of Evaluating Practical Application

Use Checklist Performance Objective 34 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 34 EVALUATION

SERVICING FILTERS, SCREENS, AND BREATHERS ON HYDRAULIC SYSTEMS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Located filters, screens and breathers on hydraulic system using operator's manual.		
2. Removed and discarded throwaway filters; replaced with new ones.		
3. Washed screens and breathers in solvent and blow dried with air compressor. Reinstalled.		
4. Added hydraulic oil as specified by operator's manual to replace any that may have been lost.		
5. Started tractor and checked for leaks.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 35

TASK

Service tractor fuel system (gasoline engine)

STANDARD OF PERFORMANCE OF TASK

Gas tank and sediment bowl must be free of all sediment. All fuel lines and fuel line filters must be free of debris. The tractor engine must be run for a period of three minutes with no fuel leaks.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 65-70.

CONDITIONS FOR PERFORMANCE OF TASK

A farm tractor
The necessary equipment

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify gasoline fuel system parts.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 32-43.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 30-44.

TEACHING ACTIVITIES

1. Review the four strokes of a four cycle engine.
2. Explain the importance of fuel system maintenance.
3. Have students identify parts of gasoline fuel system.
4. Review the safe handling and storage of gasoline.
5. Instruct students in the proper method of checking for gas leaks.
6. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 35

CRITERION-REFERENCED MEASURE

Questions

1. The __________ and __________ remove dirt and water from the gasoline fuel system.
2. Why should gas tanks be filled at the end of a work day?
3. Gas is not heavier than water, therefore fuel needs to be checked for ______________ in the bottom of the tank.

Answers

1. Fuel strainer and sediment bowl.
2. To prevent water from condensing in the fuel tank.
3. Water

Practical Application

Have students service the fuel system on a gasoline engine.

Method of Evaluating Practical Application

Use Checklist Performance Objective 35 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 35 EVALUATION

SERVICING A GASOLINE FUEL SYSTEM

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Cleaned gas tank sediment bowl: a. Shut off fuel. b. Removed sediment bowl, strainer, and gasket. Turned on gas, drained gas tank completely, and caught in a container. d. Splashed clean gas into the tank and drained. 3. Washed fuel bowl strainer in clean fuel and wiped bowl clean. f. Replaced strainer, gasket, and bowl. g. Filled tank with clean gas. h. Turned on shut-off valve and observed clean gas as bowl fills. i. Checked for gas leaks.		
2. Serviced gas lines and strainers: a. Checked fittings at end of gas lines for leakage. b. Tightened or replaced needed fittings. c. Disconnected gas line at carburetor, cleaned strainer, and reconnected line to carburetor. d. Checked for gas leaks.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 36

TASK

Service tractor fuel system (diesel engine)

STANDARD OF PERFORMANCE OF TASK

Fuel must flow freely through the lines and filters. Engine must run for three minutes with no leaks.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 108-113.

CONDITIONS FOR PERFORMANCE OF TASK

A farm tractor
Necessary equipment
Service the tractor's fuel system

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify parts of a diesel engine fuel system.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 32-41
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 47-53.

TEACHING ACTIVITIES

1. Review with students the principles of operation of a diesel engine.
2. Have students identify the parts of the diesel fuel system.
3. Lecture on the reasons for servicing diesel fuel systems.
4. Instruct students in the proper procedure for bleeding air from fuel system after service.
4. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 36)

CRITERION-REFERENCED MEASURE

Questions

1. _______________ are responsible for atomizing and spraying fuel into the cylinders of a diesel engine.
2. Air can enter the diesel fuel system when the engine runs out of fuel or when _______________, thus causing the engine to run incorrectly or not run at all.
3. Why should fuel tanks be filled at the end of each work day?

Answers

1. Injection nozzles
2. The fuel system is serviced
3. To prevent water from condensing in tank.

Practical Application

Have students service fuel system on a diesel engine.

Method of Evaluating Practical Application

Use Checklist Performance Objective 36 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 36 EVALUATION

SERVICING A DIESEL FUEL SYSTEM

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare.the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Checked operator's manual for specific specifications and followed the general guide below in servicing a diesel tractor fuel system.		
2. Cleaned the fuel tank when dirt and water accumulates. a. Drained the fuel from the tank and cleaned with steam or flushed with hot water. (NOTE: Be sure to disconnect fuel line from tank). b. Dried the tank fittings that may be leaking, or replaced fittings if tightening did not correct leaks.		
3. Serviced the fuel lines. a. Checked for loose connections, breaks, or cracks in the lines. b. Kept lines tight, being careful not to strip threads. c. Avoided bending lines. d. Replaced fuel lines with same size, shape, and length as original lines.		
4. Serviced and replaced diesel fuel filters. a. Followed the operator's manual carefully when servicing filters. b. To bleed air from filters after replacement: (1) Filled tank with fuel. (2) Opened the fuel shut-off valve at the tank.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 36 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
5. Loosened the bleed plug on the fuel filter or filters, one filter at a time.		
6. Pumped the primer lever on the fuel pump until a solid stream of fuel flows out bleed plug. (NOTE: No air bubbles should appear).		
7. Turned engine with the starter to change the position of the fuel pump cam if primer lever would not pump fuel.		
8. Tightened the bleed plug on the filter.		
9. Bled injection lines if vapor lock was still present.		
10. Loosened at least two connectors at the injection nozzles.		
11. Cranked engine until fuel flows without foam around the connectors. (NOTE: Never crank starter for more than 30 seconds).		
12. Tightened lines on injectors.		
13. Tried to start engine. (a) Checked for leaks if engine started and ran smoothly. (b) Referred to operator's manual and repeated general guide for bleeding fuel system if engine would not start.		

APPROVED: YES ____ NO ____

Evaluator's Signature Date

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 37

TASK

Service hydraulic implement control system

STANDARD OF PERFORMANCE OF TASK

The system should work in all required positions without surging or a spongy feeling.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 140-142.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with hydraulic implement control
Hydraulic oil
Filter
Operator's manual
Tools

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify hydraulic implement control system.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 94-103.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation,** pp. 144-164.

TEACHING ACTIVITIES

1. Discuss with students the fundamentals of hydraulic implement control operation.
2. Explain importance of implement control system service.
3. Define surging and explain cause.
4. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. What two implement control systems are used on tractors?
   ____________________ and ____________________

PERFORMANCE OBJECTIVE 37

CRITERION-REFERENCED MEASURE (Continued)

2. What are the four basic maintenance problems with hydraulic systems?
   a. ____________
   b. ____________
   c. ____________
   d. ____________

3. Milky oil indicates what?

Answers

1. Powerlift (Rockshaft) and remote control.
2. a. Not enough oil in the reservoir
   b. Clogged or dirty oil filters
   c. Leaking connections.
   d. Incorrect oil in the system.
3. Water in the system or water in the oil.

Practical Application

Have students service hydraulic implement control system on tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 37 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 37 EVALUATION

SERVICING HYDRAULIC IMPLEMENT CONTROL SYSTEM

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Located all service points using operator's manual as a guide.		
2. Changed any filters and cleaned all intake screens in cleaning solvent.		
3. Filled hydraulic oil level to full mark with engine at operating temperature.		
4. Checked for any leaks.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 38

TASK

Service hydraulic power steering system

STANDARD OF PERFORMANCE OF TASK

The system must be serviced according to the operator's manual. System must be serviced with proper lubricant, and fluid level must be at the "full" mark.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, p. 142.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a system having oil supply independent of the gear compartment
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify power steering system.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 94-103.
2. Hathaway, et al., **Preventive Maintenance, Fundamentals of Machine Operation,** pp. 144-164.

TEACHING ACTIVITIES

1. Discuss with students, the fundamentals of hydraulic power steering.
2. Explain importance of power steering system service.
3. Review procedures of cleaning hydraulic breathers.
4. Have students identify components of power steering system.
5. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Oil bubbles or foaming oil may indicate ____________.
2. What is the best reference for determining the correct hydraulic oil to use? __________________
3. What are the four enemies of hydraulic systems?

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. An air leak in the system
2. Operator's manual
3. a. Low oil level
   b. Dirt
   c. Leaks
   d. Incorrect oil

Practical Application

Have students service hydraulic power steering system on a tractor with this system independent of the gear compartment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 38 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 38 EVALUATION

SERVICING HYDRAULIC POWER STEERING SYSTEMS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Positioned lower links to lower position.		
2. Removed drain plug and drained oil.		
3. Ran engine briefly to remove oil from pump.		
4. Removed filter cover and filter.		
5. Installed filter and reassembled.		
6. Installed drain plug.		
7. Reinstalled drain plug.		
8. Flushed the hydraulic system with hydraulic fluid or other suitable solvent.		
9. Cleaned area around filler plug or plate.		
10. Removed filler plug or plate.		
11. Started engine and operated lift through several cycles.		
12. Rechecked oil level and added oil as necessary.		
13. Replaced filler plug or plate.		
14. Cleaned hydraulic breather.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 39

TASK

Service the cooling system

STANDARD OF PERFORMANCE OF TASK

There must be no leakage of coolant. The coolant must be at the full level, and coolant/water mixture must meet the manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 119-128.

CONDITIONS FOR PERFORMANCE OF TASKS

A farm vehicle with water cooled engine
Necessary tools
Shop rags
Service manual

ENABLING OBJECTIVES

1. Read and interpet operator's manual and follow prescribed safety procedures.
2. Identify cooling system parts.

RESOURCES

1. Buckingham, et al. **Machinery Maintenance**, pp. 58-65.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 72-85.

TEACHING ACTIVITIES

1. Review the principles of how a water cooling system works.
2. Have students identify parts of a water cooling system and safety practices.
3. Lecture on the reasons for servicing a water cooling system.
4. Place on display worn coolant hoses.
5. Instruct students in the proper use of a pressure tester.
6. Demonstrate the use of a hydrometer for checking freezing protection.
7. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 39

CRITERION-REFERENCED MEASURE

Questions

1. The radiator cap not only keeps water and coolant in the radiator but also ______________________________.
2. The ______________ is responsible for controlling the coolant flow in and out of the radiator and water jacket.
3. It takes longer for a __________ engine to cool than a __________ engine.

Answers

1. Regulates pressure in the cooling system
2. Thermostat
3. Dirty, clean

Practical Application

Have students service the cooling system of a farm vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 39 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 39 EVALUATION

SERVICING THE COOLING SYSTEM

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools, shop operator's manual and radiator coolant.		
2. Visually checked all coolant hoses for wear or deterioration. If any hoses needed replacing, sufficient coolant mixture must have been drained before hoses were removed.		
3. Removed radiator cap. (NOTE: If engine is warm release pressure slowly before removing the radiator cap).		
4. Tested water/coolant freezing point with an antifreeze tester.		
5. Tested radiator cap with pressure tester. Replaced cap if it failed to hold the pressure indicated in the service manual.		
6. Filled coolant system with water/coolant mixture to the "full" level.		
7. Tested engine and checked for coolant leakage and overheating.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING SCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 40

TASK

Test and service battery

STANDARD OF PERFORMANCE OF TASK

Battery must pass hydrometer test and be free of all corrosive materials. Terminal cables must be connected in accordance with wiring diagram in operator's manual. Tractor must start after servicing is completed.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 7-14.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Necessary supplies

ENABLING OBJECTIVES

1. Read and interpret manual and follow prescribed safety procedures.
2. Identify and select necessary supplies.

RESOURCE

Buckingham, et al. **Machinery Maintenance, Fundamentals of Machine Operation**, pp. 94-105.

TEACHING ACTIVITIES

1. Review safety practices concerning handling of batteries.
2. Lecture on the operation of batteries.
3. Discuss with students why a battery must be serviced.
4. Define and discuss priority.
5. Review with students the proper and safe method of charging a battery.
6. Have students complete checklist and answer criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. _______________ is the term used to describe the positive and negative flow of electricity.
2. Battery terminals should be cleaned with a solution containing _______.
3. Distilled water is the best type of water to put in a battery however, ____________ is the second best.

PERFORMANCE OBJECTIVE 40

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Polarity
2. Baking soda and water
3. Rain

Practical Application

Have students test and service a battery.

Method of Evaluating Practical Application

Use Checklist Performance Objective 40 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 40 EVALUATION

TESTING AND SERVICING A BATTERY

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Located battery. (NOTE: Before removing unsealed battery, battery must be ventilated to prevent a possible explosion of accumulated hydrogen gas).		
2. Removed battery from tractor. Note polarity.		
3. Checked battery acid/water solution strength prior to adding water.		
4. Filled battery cells to proper level with clean water with battery syringe.		
5. Cleaned battery by applying a strong solution of baking soda and water. Kept solution from getting in battery.		
6. Flushed the battery (outside case) with clean water when cleaning action (bubbling) slows down.		
7. Cleaned battery terminals and battery terminal clamp using baking soda and water solution.		
8. Charged battery.		
9. Replaced battery in tractor battery box making sure box and battery were clean.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 40 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
10. Tightened battery clamp to secure battery (Do not overtighten as battery may crack).		
11. Coated terminals with light grease.		
12. Connected battery cable clamps to terminals tightly. (NOTE: Maintain polarity).		
13. Replaced battery if old battery would not hold a charge.		
14. Kept sparks or open flame away from battery, especially while battery was being charged.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 41

TASK

Adjust band brakes

STANDARD OF PERFORMANCE OF TASK

Brakes must be adjusted to allow equal braking action per wheel with approximately one inch of pedal free travel.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 8-82.

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with band brakes
Operator's manual
Tools
Jacks

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify band brakes and adjustment points.

RESOURCES

1. **McCormick Farmall 130 and International 130 Tractors**. Operator's Manual, pp. 65-66.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 178-180.

TEACHING ACTIVITIES

1. Discuss with students the principle of band brake operation.
2. Explain importance of brake service.
3. Review safe jacking procedures. (OSHA)
4. Have students identify all adjustment points.
5. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 41

CRITERION-REFERENCED MEASURE

Questions

1. Band brakes operate by internal expansion or external contraction. ________________.
2. What agency develops safe working procedures and monitors the work place for safety violations? ________________
3. When force is removed from the brake pedal, what releases the band from the drum? ________________

Answers

1. External contraction
2. OSHA
3. Retracting spring

Practical Application

Have students adjust band brakes.

Method of Evaluating Practical Application

Use Checklist Performance Objective 41 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 41 EVALUATION

ADJUSTING BAND BRAKES

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual for correct procedures		
2. Assembled necessary tools, equipment, and supplies.		
3. Jacked up one wheel at a time, and adjusted brake linkage according to directions. Shortened linkage to take up excessive free travel at brake pedal. (NOTE: All manufacturer's OSHA jacking procedures must be followed).		
4. Adjusted both brakes to equal height of pedal and secured all pins and keys.		
5. Lowered farm machinery and test drove to check adjustment. (NOTE: Wheels should not lock and machinery should not swerve to either side).		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 42

TASK

Adjust carburetor air/fuel/idle mixture

STANDARD OF PERFORMANCE OF TASK

The engine will run smoothly, and no black smoke will come from the exhaust. The manufacturer's specifications will be met.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 74-77.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Screwdriver
Adjust the carburetor air/fuel/idle mixture

ENABLING OBJECTIVES

1. Read and interpret operator's manual and follow prescribed safety procedures.
2. Identify carburetor adjustment points.

RESOURCES

1. **Fundamentals of Service: Electrical Systems**, Chapter 3, pp. 1-19.
2. Hathaway, et al. **Preventive Maintenance, Fundamentals of Machine Operation**, pp. 30-54.

TEACHING ACTIVITIES

1. Explain the importance of optimum air/fuel/idle mixture.
2. Review the principle of carburetor operation.
3. Have students identify carburetor adjustments.
4. Explain the use of tachometers and proper reading of tachometer.
5. Allow students to listen to a properly running engine.
6. Have students complete checklist and answer criterion-referenced questions.

PERFORMANCE OBJECTIVE 42

CRITERION-REFERENCED MEASURE

Questions

1. What are two results of an improperly adjusted carburetor? ____________ & ____________.
2. The ____________ creates a rich fuel mixture for starting a cold engine.
3. Black smoke coming from the exhaust is an indication of ____________.

Answers

1. Poor fuel economy and lower horsepower.
2. Choke
3. A too rich fuel to air ratio.

Practical Application

Have students adjust carburetor air/fuel/idle mixture.

Method of Evaluating Practical Application

Use Checklist Performance Objective 42 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 42 EVALUATION

ADJUSTING CARBURETOR AIR/FUEL/IDLE MIXTURE

Student's Name **Date**

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Checked engine air cleaner and made sure that the engine can get clean, nonrestricted air.		
2. Started engine, and warmed to normal operating temperature.		
3. Turned idle adjustment screw in until the engine began to run irregularly.		
4. Turned the screw in the opposite direction until engine once again ran irregularly.		
5. Turned the screw clockwise and counter clockwise until engine ran smoothly.		
6. Advanced the throttle two or three times and then let the engine return to idle speed. (NOTE: If the engine continues to run smoothly and there is no black smoke from the exhaust, the adjustment is correct. Otherwise, further idle speed screw adjustment is indicated).		
7. Checked setting with tachometer.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 43

TASK

Adjust disc brakes

STANDARD OF PERFORMANCE OF TASK

Brakes must have equal braking action per wheel and approximately one inch pedal free travel.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, p. 80.

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with disc brakes
Necessary tools
Equipment
Shop rags
Operator's manual

ENABLING OBJECTIVES

1. Identify disc brakes.
2. Identify the caliper.

RESOURCE

Stockel, et al. **Auto Mechanics Fundamentals,** pp. 449-451.

TEACHING ACTIVITIES

1. Review the basics of hydraulics.
2. Discuss the importance of having the brake system working properly.
3. Discuss the construction and operation of the caliper.
4. Show students how to bleed the disc brake caliper.
5. Show students a disc pad that is worn to the point that it needs to be replaced.

PERFORMANCE OBJECTIVE 43

CRITERION-REFERENCED MEASURE

Questions

1. Disc brakes are operated by ____________________________ oil.
2. Brakes should always be ________________ when on the highway.
3. Tractor's left and right brakes are located on separate pedals to assist in ________________.

Answers

1. Hydraulic
2. Locked
3. Turning

Practical Application

The students will adjust the disc brakes on a given vehicle in 2 hours using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 43 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 43 EVALUATION

ADJUSTING DISC BRAKES

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual for correct procedure.		
2. Assembled necessary tools, equipment, and supplies.		
3. Jacked vehicle so wheels are off the ground and installed jacks. (NOTE: All manufacturer's and OSHA jacking procedures must be followed).		
4. Followed directions and adjusted brake pedals to usual height. a. Adjusted brake pedal free travel (one inch free travel). b. Checked brakes for equal braking action. (NOTE: If the brakes cannot be adjusted evenly, new brake linings may be needed).		
5. Lowered vehicle.		
6. Test drove vehicle to check for proper adjustment.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 44

TASK

Adjust drawbar

STANDARD OF PERFORMANCE OF TASK

Adjust height of the drawbar in accordance to operator's manual and ASAE-SAE standards. Height of drawbar must not exceed 17 inches from ground point and 8 inches from centerline of PTO shaft.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, p. 155.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor equipped with drawbar
Proper hand books
Operator's manual

ENABLING OBJECTIVES

1. Locate the drawbar on a given tractor.
2. Use an operator's manual.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 324-325.

TEACHING ACTIVITIES

1. Using a prepared chart, point out where the center of pull is on a tractor as determined by the drawbar.
2. Discuss the importance of having the drawbar swing, in reference to ease of turning some types of agricultural equipment.
3. Discuss the importance of ground point distance and distance from centerline of PTO shaft.
4. Demonstrate the steps in the performance evaluation.
5. Have students complete the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. The height of the drawbar must not exceed ____________ inches from the ground point.
2. The height of the drawbar must not exceed ____________ inches from centerline of the PTO shaft.

PERFORMANCE OBJECTIVE 44

CRITERION-REFERENCED MEASURE (Continued)

3. The first step in adjusting the drawbar is to loosen the ____________ adjustment bolts.

Answers

1. 17
2. 8
3. Vertical

Practical Application

Have students adjust the drawbar on a given tractor in 30 minutes using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 44 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 44 EVALUATION

ADJUSTING THE DRAWBAR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Selected proper hand tools.		
3. Loosened vertical adjustment bolts.		
4. Adjusted height of drawbar from 13 inches to 17 inches from ground and 8 inches down from center line of PTO shaft.		
5. Tightened vertical adjustment bolts.		
6. Checked height measurement.		
7. Rechecked after field operation use.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY

PERFORMANCE OBJECTIVE 45

TASK

Adjust drum brakes

STANDARD OF PERFORMANCE OF TASK

Adjusting the brakes following the vehicle manufacturer's specifications. Brakes must have equal braking action per wheel and approximately one inch pedal free travel.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle
Operator's manual
Proper tools
Equipment

ENABLING OBJECTIVES

1. Identify drum brakes.
2. Identify the master cylinder.

RESOURCES

1. Operator's manual.
2. Stockel, et al. **Auto Mechanics Fundamentals**, pp. 431-449.

TEACHING ACTIVITIES

1. Using a prepared drawing, review the parts of a drum brake system.
2. Discuss how drum brakes work.
3. Read and discuss the textbook, **Auto Mechanics Fundamentals**, pp. 431-449.
4. Quiz students by stating problems and letting them discuss solutions.
5. Have students complete the criterion questions listed.

PERFORMANCE OBJECTIVE 45

CRITERION-REFERENCED MEASURE

Questions

1. The first step, once the vehicle is jacked up, is to remove the brake backing plate __________ __________.
2. To adjust the star wheel, we use a brake adjustment __________
3. The final step before reinstalling dust seals, is to check __________ __________ operation.

Answers

1. Dust seals
2. Spoon
3. Brake pedal

Practical Application

The students will adjust the drum brakes on a given vehicle in 2 hours using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 45 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 45 EVALUATION

ADJUSTING THE DRUM BRAKES

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools, equipment and operator's manual.		
2. Raised the vehicle wheels off the floor. (NOTE: All manufacturer and OSHA jacking procedures must be followed).		
3. Removed brake backing plate dust seals--Bendix brakes.		
4. Turned star-wheel adjuster with brake adjustment spoon following manufacturer's procedures.		
5. Checked brake pedal operation and reinstalled dust seals.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 46

TASK

Adjust engine governor

STANDARD OF PERFORMANCE OF TASK

Adjust engine governor in accordance with manufacturer's specifications. The tractor's engine must respond from idle to full power while operating without engine miss. The governor must respond quickly to change in load conditions and maintain the correct engine speed without surging.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, p. 143.

CONDITIONS FOR PERFORMANCE OF TASK

Supplies
Equipment
A tractor with engine governor out of adjustment

ENABLING OBJECTIVES

1. Outline the purpose of the governor and how it works.
2. Identify the governor.

RESOURCES

1. Operator's manual.
2. Stockel, et al. **Auto Mechanics Fundamentals**.

TEACHING ACTIVITIES

1. Discuss the purposes of the governor.
2. Use a tractor to show how performance is affected by a governor in need of adjustment.
3. Point out the parts of the governor.
4. Demonstrate the steps in the performance guide.
5. Have students complete the criterion questions.

PERFORMANCE OBJECTIVE 46

CRITERION-RERENCED MEASURE

Questions

1. Poor engine performance could be caused by the __________ needing adjusting.
    a. Brakes
    b. Drawbar
    c. Governor
    d. None of these
2. In order to adjust the governor properly you will need the __________ __________.
3. The screws used to adjust the governor are called the ______________ screw.

Answers

1. c
2. Operator's manual
3. Stop

Practical Application

The student will adjust the engine governor of a given tractor using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 46 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 46 EVALUATION

ADJUSTING THE ENGINE GOVERNOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired service guide and other supplies.		
2. Read service guide on making adjustments.		
3. Attached tractor PTO to dynamometer (if engine is in tractor).		
4. Ran engine under light load at half throttle until normal temperature was reached.		
5. Adjusted no-load idle and maximum speeds to those listed in manual by adjusting throttle limiting or stop screws on governor.		
6. Loaded engine with dynamometer to rated PTO RPM. NOTE: If governor is not opening, it will have to be serviced or repaired by a trained technician.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 47

TASK

Adjust engine valves

STANDARD OF PERFORMANCE OF TASK

The valves must be adjusted so the engine starts easily and maximum power is produced during operation. Adjusted valve must be ± .001 inch of recommended specifications.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 45-53.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Tools
Operator's manual

ENABLING OBJECTIVES

1. Identify and use a feeler gauge.
2. Identify valves, rocker arms and adjusting screw.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 244-251.

TEACHING ACTIVITIES

1. Demonstrate the proper use of a feeler gauge.
2. Demonstrate the use of the operator's manual to determine specification for adjusting the valves on a given piece of farm equipment.
3. Demonstrate the steps in the performance guide.
4. Read and discuss the textbook, **Agricultural Power and Machinery**.
5. Have students complete the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. When adjusting the valve, we use a ___________ to determine if we have the proper clearance.
    a. feeler gauge
    b. inside micrometer
    c. outside micrometer
    d. metric ruler

CRITERION-REFERENCED MEASURE (Continued)

2. The ___________ ______________ is used to determine whether to check the valve clearance when the engine is hot or cold.
3. Always use a _____________ wrench to check cylinder head for tightness.
    a. adjustable
    b. torque
    c. box-end
    d. metric

Answers

1. a
2. Operator's manual
3. b

Practical Application

Have students adjust engine valves.

Method of Evaluating Practical Application

Use Checklist Performance Objective 47 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 47 EVALUATION

ADJUSTING ENGINE VALVES

Student's Name **Date**

DIRECTIONS TO STUDENT: Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR: Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Gathered needed tools.		
2. Read operator's manual to determine whether you should check valve clearance while the engine is hot or cold.		
3. Removed all tractor parts that interfere with the removal of valve cover.		
4. Removed dirt from valve cover and from around spark plugs.		
5. Removed nuts or screw clamps that hold valve (rocker arms) cover.		
6. Removed valve cover carefully.		
7. Avoided accidental starting of engine during valve adjustment by: a. Disconnecting the center terminal wire to the distributor with spark ignition engines, or b. Cutting the fuel supply off at the injection pump with diesel engines.		
8. Checked cylinder head for tightness using torque wrench.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 47 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
9. Turned crankshaft slowly until piston in No. 1 cylinder is at top dead center of compression stroke.		
10. Selected the feeler-gauge thickness(es) recommended for the valves on your tractor.		
11. Checked clearance by inserting gauge between valve stem and rocker arm of both valves.		
12. Loosened adjusting screw lock nut on valve rocker arm.		
13. Turned adjusting screw with screwdriver until feeler gauge will just slip in and out of gap.		
14. Held adjusting screw with screwdriver and tightened lock nut with wrench.		
15. Rechecked clearance between valve stem and rocker arms of both valves.		
16. Determined which cylinder fires next.		
17. Turned crankshaft until next cylinder in firing order was on compression.		
18. Adjusted valves following same procedures as on No. 1 cylinders.		
19. Checked valve cover gasket; replaced if needed.		
20. Replaced valve cover and tightened to proper torque.		

APPROVED: YES _____ NO ____

Evaluator's Signature   Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 48

TASK

Adjust foot clutch

STANDARD OF PERFORMANCE OF TASK

The clutch must be adjusted so the clearance between the clutch-release bearing and release finger is between 1/16 inch and 3/16 inch depending on operator's manual.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 83-85.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a foot clutch needing adjustment
Equipment
Tools
Operator's manual

ENABLING OBJECTIVES

1. Identify the clutch and all parts which are necessary in order to adjust it.
2. Name and describe the two basic clutches found on agricultural machinery.

RESOURCES

1. Jacobs, et al. **Agricultural Power and Machinery**, pp. 114-118.
2. Operator's manual for the given tractor.

TEACHING ACTIVITIES

1. List and describe the two basic types of clutches found on agricultural machinery.
2. Demonstrate how to look up proper adjustments in an operator's manual.
3. Demonstrate the steps in the performance guide.
4. Read and discuss the textbook, **Agricultural Power and Machinery**, pp. 114-118.
5. Have students complete criterion-referenced questions.

PERFORMANCE OBJECTIVE 48

CRITERION-REFERENCED MEASURE

Questions

1. We must tighten the __________ _________ after adjusting the clutch to make sure the adjustment stays secure.
2. The clutch is adjusted between ______ and ______ depending on what the operator's manual states.
   a. 1/4 and 1/2 inches
   b. 1 and 2 inches
   c. 1/16 and 3/16 inch
   d. None of these
3. Adjustments to the clutch are made on its __________ .

Answers

1. Lock nut
2. c
3. Linkage

Practical Application

Have students adjust foot clutch.

Method of Evaluating Practical Application

Use Checklist Performance Objective 48 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 48 EVALUATION

ADJUSTING FOOT CLUTCH

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained necessary tools, equipment, and operator's manual.		
2. Determined from the operator's manual how much free travel is needed.		
3. Checked clutch pedal for travel.		
4. Located clutch adjustment.		
5. Located clutch linkage until clutch pedal had sufficient free travel.		
6. Tightened lock nut to hold adjustment securely.		
7. Started engine and checked clutch for proper performance.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 49

TASK

Adjust front wheel bearings

STANDARD OF PERFORMANCE OF TASK

Wheel bearings must be adjusted so there is no drag or end play and torqued to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Shop rags
Necessary tools
Operator's manual

ENABLING OBJECTIVES

1. Identify wheel bearings.
2. Identify the hub cap, dust cap and cotter pin.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 229-231.

TEACHING ACTIVITIES

1. Discuss the importance of the hub and dust cap.
2. Explain the importance of adjusting the wheel bearing properly by noting what will happen if done improperly.
3. Read and discuss textbook, **Agricultural Power and Machinery**, pp. 229-231.
4. Demonstrate the steps in the performance guide.
5. Have students complete the criterion-referenced questions listed.

PERFORMANCE OBJECTIVE 49

CRITERION-REFERENCED MEASURE

Questions

1. Since the adjustment for wheel bearings is not the same on all tractors, we must always check the ____________________ ________________.
2. Since tractors are heavier than many vehicles, it is important to follow _______________ jacking procedures.
   a. OSHA
   b. standard
   c. automobile
   d. none of these
3. We tighten the spindle nut until there is pressure on the nut in order to _______________ the bearings.

Answers

1. Operator's manual
2. a
3. seat

Practical Application

Have students adjust front wheel bearings.

Method of Evaluating Practical Application

Use Checklist Performance Objective 49 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 49 EVALUATION

ADJUSTING FRONT WHEEL BEARINGS

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools, shop rags, and operator's manual.		
2. Locked rear wheels and jacked the front end of the tractor off the ground. (NOTE: All manufacturer's and OSHA jacking procedures must be followed).		
3. Removed hub cap, dust cap, and old cotter pin.		
4. Loosened bearing adjusting nut and bearing thrust washer.		
5. Tightened bearing adjusting nut putting pressure against the thrust washer.		
6. Checked for bearing drag and end play.		
7. Torqued bearing to manufacturer's specifications.		
8. Installed cotter pin into spindle slot and secured.		
9. Replaced bearing dust cover cap and hub cap.		
10. Removed tractor from jacks.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MAINTENANCE

PERFORMANCE OBJECTIVE 50

TASK

Adjust headlights

STANDARD OF PERFORMANCE OF TASK

Adjustment must meet state requirements for the piece of farm machinery.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with headlights
Headlight aimer
Operator's manual
The necessary tools

ENABLING OBJECTIVES

1. Have experience using the needed tools.
2. Choose the proper type of headlight.

RESOURCE

Stockel, et al. **Auto Mechanics Fundamentals**, p. 506.

TEACHING ACTIVITIES

1. Review problems one can face with improper headlight adjustment.
2. Identify the tools needed to adjust headlights.
3. Use an old headlight to show the parts of the system.
4. Discuss the use of halogen headlamps.
5. Have students complete the criterion-referenced questions listed.

PERFORMANCE OBJECTIVE 50

CRITERION-REFERENCED MEASURE

Questions

1. The first step in adjusting the headlights is to place the vehicle on ______ ground.
2. Adjustment must meet ____________ requirements.
3. Where we tighten the adjusting screw on the headlight, we compress the head lamp adjusting _________.

Answers

1. Level
2. State
3. Spring

Practical Application

The student will adjust the headlights on a given vehicle in 45 minutes using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 50 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 50 EVALUATION

ADJUSTING HEADLIGHTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Placed vehicle on level surface with wheels straight ahead.		
2. Removed retainer ring(s) from headlight beam(s) and secured so adjustments may be made.		
3. Adjusted high and low beam of headlights in accordance with manufacturer's specifications to meet state requirements.		
4. Replaced retainer ring(s) on headlight beam(s) and secured.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 51

TASK

Adjust ignition timing

STANDARD OF PERFORMANCE OF TASK

Timing must be set with 100 percent accuracy as specified in the operator's manual.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures. pp. 99-102.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with correct point gap that is out of time
Operator's manual
A timing light
The necessary tools

ENABLING OBJECTIVES

1. Be able to use a timing light.
2. Identify the basic parts of the ignition system.

RESOURCES

1. Jacobs, et al. **Agricultural Power and Machinery**, pp. 215-216.
2. Operator's manual.

TEACHING ACTIVITIES

1. Review the ignition system in a gasoline engine.
2. Review the use of a timing light.
3. Discuss the importance of proper timing in relation to performance and fuel efficiency.
4. Discuss how the timing light has improved engine performance.
5. Have students complete the criterion-referenced questions.

PERFORMANCE OBJECTIVE 51

CRITERION-REFERENCED MEASURE

Questions

1. The purpose of timing is to get the spark plug to __________ the fuel air mixture at the proper time.
2. If the breaker point gap is changed, it will:
   a. Affect timing
   b. Not affect timing
   c. Damage the spark plug.
3. Engine ____________ will affect timing.
   a. type
   b. RPM
   c. make

Answers

1. Ignite
2. a
3. b

Practical Application

The student will adjust the ignition timing in one hour using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 51 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 51 EVALUATION

ADJUSTING IGNITION TIMING

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Checked operator's manual for proper specifications.		
2. Located timing marks on flywheel or fan pulley.		
3. Connected timing light as recommended by manufacturer.		
4. Determined from operator's manual what timing mark to use with light and correct engine RPM.		
5. Chalked the timing mark so it is easily seen.		
6. Started engine and ran at speed recommended in operator's manual.		
7. Directed timing light at markings on flywheel or on fan pulley.		
8. Loosened clamps that hold distributor.		
9. Turned distributor body slightly until timing mark was opposite the pointer.		
10. Tightened distributor.		
11. Rechecked timing after tightening.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 51 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
12. Removed timing light.		
13. Replaced cover over timing hole if removed.		

APPROVED: YES _____ NO ____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY

PERFORMANCE OBJECTIVE 52

TASK

Adjust V-Belts

STANDARD OF PERFORMANCE OF TASK

Engine must run for five minutes without overheating, and belt must maintain desired tension.

SOURCE OF STANDARD

Virginia Writing Team
Tractor Maintenance Principles and Procedures, pp. 16-17.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Proper tools

ENABLING OBJECTIVES

1. Review the parts of the belt and pulley system.
2. Read and discuss the textbook **Agricultural Power and Machinery**.
3. Explain the importance of proper tension.
4. Have students complete the criterion-referenced questions below.
5. Have students complete the performance checklist attached to this lesson.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp 139-141.

TEACHING ACTIVITIES

1. Review the parts of the belt and pulley system.
2. Read and discuss pages 139-141 in **Agricultural Power and Machinery**.
3. Explain the importance of proper tension.
4. Have the students complete the criterion-referenced questions.
5. Have the students complete the performance checklist attached to this lesson.

PERFORMANCE OBJECTIVE 52

CRITERION-REFERENCED MEASURE

Questions

1. Attempting to pry a belt over the sleeves is recommended:
   a. Only after you have loosened it
   b. Never
   c. Anytime.
2. If tension is too loose it will result in the belt ___________.
3. Belt overheating, stretching and sheave damage are caused from the tension on the belt being too ___________ .

Answers

1. b
2. Slipping
3 Tight

Practical Application

Have students adjust V-Belts.

Method of Evaluating Practical Application

Use Checklist Performance Objective 52 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 52 EVALUATION

ADJUSTING V-BELTS

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Selected the proper hand tools and equipment.		
3. Checked V-Belts tension with ruler or spring gauge and compared with specifications.		
4. If belt tension was incorrect, tightened or loosened by adjusting.		
5. Started engine and observed operation of V-Belt.		
6. Stopped engine and rechecked V-Belt tension.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 53

TASK

Adjust wheel spacing (front)

STANDARD OF PERFORMANCE OF TASK

Adjust front wheel spacing in accordance with operator's manual. The extension axles must be:

1. Tight
2. Adjusted to crop and terrain
3. Adjusted to run on outside of rows
4. Set so that the center line of the front wheels is in line with center line of rear wheels.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS OF PERFORMANCE OF TASK

A tractor
Operator's manual
Proper tools

ENABLING OBJECTIVES

1. Use a jack in accordance to OSHA jacking procedures.
2. Identify the parts of the front axle.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 228-229.

TEACHING ACTIVITIES

1. Review the parts of the front tractor axle.
2. Discuss the reasons for adjusting the axle.
3. Read and discuss the textbook, **Agricultural Power and Machinery**, pp. 228-229.
4. Demonstrate the steps in the performance guide.
5. Have students complete the criterion-referenced questions listed.
6. Have students complete the performance checklist attached to this lesson.

PERFORMANCE OBJECTIVE 53

CRITERION-REFERENCED MEASURE

Questions

1. We must adjust the axles to ______________ and _________ .
2. Desired spacing is determined by __________________ width.
3. It is important for front wheel treads to be:
   a. In line with rear wheel treads
   b. Adjusted according to operator's manual
   c. Adjusted according to terrain
   d. All of the above.

Answers

1. Crop, terrain
2. Row
3. d

Practical Application

Have students adjust wheel spacing (front).

Method of Evaluating Practical Application

Use Checklist Performance Objective 53 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 53 EVALUATION

ADJUSTING WHEEL SPACING (FRONT)

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Selected proper tools and equipment.		
3. Placed tractor on level ground.		
4. Locked brakes on rear wheels or block wheels. (NOTE: OSHA jacking procedures must be followed).		
5. Jacked up front end of tractor.		
6. Loosened both extension axles.		
7. Loosened steering linkage.		
8. Adjusted tie rods/drag links.		
9. Tightened axle bolts.		
10. Adjusted tie rods/drag links and tightened.		
11. Removed jack from under front wheels.		
12. Checked spacing in field.		
13. Checked for proper toe-in of front wheel.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 54

TASK

Adjust wheel spacing (rear)

STANDARD OF PERFORMANCE OF TASK

Adjust the rear wheel spacing to the instructor's specifications. The rear wheel lock nuts will be tightened and adjusted to the crop being worked. Attending instructor must agree that the rear adjustments are made in accordance with operator's manual.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Proper tools

ENABLING OBJECTIVES

1. Use jack in accordance to OSHA procedures
2. Measure crop spacing.

RESOURCE

Operator's manual for a given tractor.

TEACHING ACTIVITIES

1. Review crop spacing as it affects rear wheel spacing.
2. Discuss safety as it affects the handling of the heavy wheels.
3. Demonstrate the steps in the performance guide.
4. Let students demonstrate the steps in the performance guide.
5. Have students complete criterion-referenced questions.

PERFORMANCE OBJECTIVE 54

CRITERION-REFERENCED MEASURE

Questions

1. It is important to place the tractor on _____ ground before jacking.
2. Before jacking the rear wheel, be sure to:
    a. Loosen lock nuts
    b. Block front wheels
    c. Select proper tools.
3. The rear wheels must be spaced to go along with ____________ .
    a. Row spacing
    b. Crop type

c. Land type.

Answers

1. Level
2. b
3. a

Practical Application

Have students adjust wheel spacing (rear).

Method of Evaluating Practical Application

Use Checklist Performance Objective 54 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 54 EVALUATION

ADJUSTING WHEEL SPACING (REAR)

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Selected proper tools and equipment.		
3. Placed tractor on level ground.		
4. Blocked front wheels.		
5. Loosened lock nuts on wheels.		
6. Adjusted rear wheels to desired spacing. (NOTE: Some models require placing transmission in forward/reverse to widen wheels while engaging the brakes).		
7. Tightened lock nuts on wheels.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 55

TASK

Arc weld steel to steel

STANDARD OF PERFORMANCE OF TASK

The weld must be uniform and as strong as the original material. The repaired part must function as designed when refitted on piece of machinery.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A broken steel part
Welding machine
Equipment

ENABLING OBJECTIVES

1. Strike the arc.
2. Maintain proper arc length and proper speed.

RESOURCE

Wakeman. **The Farm Shop**, pp. 129-162.

TEACHING ACTIVITIES

1. Review proper welding procedures for welding mild steel.
2. Discuss electrode selection.
3. Discuss selecting proper amperage.
4. Review welding safety rules.
5. Have students complete criterion-referenced questions.

PERFORMANCE OBJECTIVE 55

CRITERION-REFERENCED MEASURE

Questions

1. Before welding steel to steel, both pieces must be cleaned and ______ properly.
2. Poor penetration can result with improper __________ selection.
3. Welding over old _____________ will cause a weak spot.

Answers

1. Grounded
2. Amperage
3. Slag

Practical Application

The student will weld steel to steel in repairing a given piece of farm machinery in 45 minutes using the necessary tools.

Method of Evaluating Practical Application

Use Checklist Performance Objective 55 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 55 EVALUATION
ARC WELDING STEEL TO STEEL

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained arc welder, proper size and type of electrodes, and protective equipment. Had work area well ventilated and free of flammable materials.		
2. Prepared metal to be welded by cleaning, grinding, positioning, etc. (Part may have to be removed).		
3. Attached ground cable and adjusted machine to specified setting.		
4. Welded the joint (NOTE: Slag must be removed between passes).		
5. Cleaned finished weld; allowed to cool.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 56

TASK

Bleed hydraulic accessory system and components

STANDARD OF PERFORMANCE OF TASK

The system must be bled so all trapped air is removed. Hydraulic system must be bled until a steady stream of fluid flows out of the ports. The bleeder ports must be tightened, and the hydraulic system must provide immediate response when operated.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor complete with hydraulic system and components

ENABLING OBJECTIVES

1. Identify hydraulic system parts.
2. Have experience in using the hydraulic system.

RESOURCE

Operator's manual for a given tractor

TEACHING ACTIVITIES

1. Review the hydraulic system and what makes it work.
2. Go over the operator's manual for the given tractor.
3. Demonstrate the steps in the performance guide.
4. Allow students to demonstrate steps in the performance guide.
5. Allow students to complete criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Before bleeding the system you must:
   a. Turn the engine off
   b. Warm to operating temperature
   c. Have full tank of fuel
2. Check the hydraulic oil in the reservoir to make sure it is __________ after bleeding out all the air.
3. Be sure system is pressurized while bleeding to prevent __________ from entering the lines.

PERFORMANCE OBJECTIVE 56

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. b
2. Full
3. Air

Practical Application

Have students bleed hydraulic accessory system and component.

Method of Evaluating Practical Application

Use Checklist Performance Objective 56 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 56 EVALUATION

BLEEDING HYDRAULIC ACCESSORY SYSTEM AND COMPONENTS

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Started engine and warmed to operating temperature.		
2. Operated hydraulic components to their fullest length.		
3. Opened bleeder valve to release hydraulic fluid and then closed tightly. (NOTE: Be sure system is pressurized while bleeding to prevent air from entering the lines).		
4. Repeated steps 2 and 3 until only fluid was emitted from the bleeder port.		
5. Checked hydraulic oil in resevoir to make sure it was full after bleeding out all air.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 57

TASK

Braze sheet metal

STANDARD OF PERFORMANCE OF TASK

Edges around the repaired area must be smooth and bonded.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery needing sheet metal repair

ENABLING OBJECTIVES

1. Familiar with lighting and properly setting the torch
2. Identify the safety rules that apply to oxyacetylene welding.

RESOURCE

Wakeman. **The Farm Shop**, pp. 166-189.

TEACHING ACTIVITIES

1. Review gas welding safety rules.
2. Discuss the importance of proper torch size.
3. Discuss the importance of using flux.
4. Have students complete the performance check list attached to this lesson.
5. Have the students complete the criterion-referenced questions listed.

CRITERION-REFERENCED MEASURE

Questions

1. __________ is used to prevent oxidation.
2. __________ is important so that metal stays aligned.
3. It is important to regulate hose __________ to prevent accidents.

Answers

1. Flux
2. Tacking
3. Pressures

PERFORMANCE OBJECTIVE 57

CRITERION-REFERENCED MEASURE (Continued)

Practical Application

The student will braze sheet metal in 30 minutes using the needed tools and equipment.

Method of Evaluating Practical Application

Use Checklist Performance Objective 57 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 57 EVALUATION

BRAZING SHEET METAL

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Assembled necessary welding equipment, safety devices, and metal to be brazed.		
2. Selected proper torch size welding rods, flux, and regulator pressures.		
3. Cleaned and prepared joints to be brazed.		
4. Aligned joint allowing 1/16 inch space between pieces.		
5. Lit and adjusted torch to neutral flame.		
6. Heated joint and applied flux.		
7. Tacked joint on each end.		
8. Brazed joint.		
9. Cleaned and checked braze.		

APPROVED: YES ____ NO ____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 58

TASK

Clean carburetor

STANDARD OF PERFORMANCE OF TASK

The inside of the carburetor will be clean. No jets or holes will be plugged or coated.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

End wrenches
Screwdrivers
Clean rags
Solvent
Safety glasses or face shield
Air holes

ENABLING OBJECTIVES

1. Identify the parts of a carburetor
2. Use good safety rules.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, p. 289.

TEACHING ACTIVITIES

1. Review the parts of a carburetor.
2. Discuss the importance of a clean carburetor.
3. Demonstrate the steps in the performance guide.
4. Let students complete the steps in the performance guide.
5. Have students complete criterion-referenced questions.

PERFORMANCE OBJECTIVE 58

CRITERION-REFERENCED MEASURE

Questions

1. The first step to follow before removing a carburetor is to shut off the ______________ valve.
2. One of the most frequent problems with carburetor is a plugged up ______________.
3. When re-assembling the carburetor it is often necessary to replace the ______________
    a. jets
    b. gaskets
    c. screws
    d. None of these

Answers

1. Fuel
2. Jet
3. b

Practical Application

Have students clean a carburetor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 58 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 58 EVALUATION

CLEANING CARBURETOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Shut off fuel valve under fuel tank and removed carburetor from engine.		
2. Removed screws from top of carburetor.		
3. Wiped all dirt and sludge from inside and outside carburetor top, float, needle, valve and seat.		
4. Put on safety glasses.		
5. Blew dirt with air hose from top half of carburetor, including jets and crevices.		
6. Replaced needle valve, seat, and float assembly. Checked float adjustment.		
7. Cleaned the bottom half of the carburetor, removing gasoline, water, rust, etc., by scraping with a knife if necessary.		
8. Reassembled, replacing gasket if needed.		
9. Installed carburetor, turned on fuel, started engine and adjusted.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 59

TASK

Cut stock metal for repairing farm machinery using an oxyacetylene torch

STANDARD OF PERFORMANCE OF TASK

Metal must be cut to length designated by the instructor, and edge of cut must be smooth and free of slag.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of stock metal
Oxyacetylene torch
Equipment

ENABLING OBJECTIVES

1. Familiar with lighting and adjusting the torch to the neutral flame.
2. Identify the proper safety rules that apply to gas welding.

RESOURCE

Wakeman. **The Farm Shop, pp. 170-192.**

TEACHING ACTIVITIES

1. Review the safety rules.
2. Read and discuss the textbook.
3. Point out problems one may face due to improper torch adjustments.
4. Demonstrate problems from having torch too close or too far from the metal being cut.
5. Have students complete performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. Hold the torch ______ inches from the metal being cut.
    a. 1
    b. 1/2
    c. 1/8
    d. 1/4
2. Hold the torch at a ______ degree angle to the metal being cut when beginning.
3. After welding, always shut off the tanks and ______ the lines.

PERFORMANCE OBJECTIVE 59

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. c
2. 90
3. Bleed

Practical Application

The student will cut stock metal for repairing farm machinery using an oxyacetylene torch in 30 minutes.

Method of Evaluating Practical Application

Use Checklist Performance Objective 59 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 59 EVALUATION

CUTTING STOCK METAL FOR REPAIRING FARM MACHINERY USING AN OXYACETYLENE TORCH

Student's Name **Date**

DIRECTIONS TO STUDENT: Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR: Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Assembled stock metal, oxyacetylene cutting equipment, and safety equipment.		
2. Measured stock and marked with soapstone or chalk.		
3. Opened tank valves and adjusted regulators to proper pressures for thickness of metal being cut.		
4. Lighted and adjusted torch to neutral flame.		
5. Held torch tip 1/8 inch from, and 90° to metal being cut.		
6. Tilted tip 60° - 70° to metal being cut or 20° - 30° if cutting sheet metal.		
7. Proceeded with cut (smooth and free of slag).		
8. After finishing cut, closed tank valves and bled lines.		
9. Cooled metal to avoid burning.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 60

TASK

Form metal (bend, shape) using an oxyacetylene torch to repair farm machinery

STANDARD OF PERFORMANCE OF TASK

The metal must be bent so as to fit the machinery being repaired.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Metal
Oxyacetylene torch
Equipment

ENABLING OBJECTIVES

1. Familiar with lighting the torch and maintaining a neutral flame.
2. Identify proper gas welding safety rules.

RESOURCE

Wakeman. **The Farm Shop**, pp. 166-172.

TEACHING ACTIVITIES

1. Discuss how bending is much easier when metal is heated to cherry red.
2. Review safety rules for using a gas welder.
3. Demonstrate the steps in the performance guide.
4. Allow students to practice bending with scrap metal.
5. Show students how cooling method can affect the hardness of metal.

PERFORMANCE OBJECTIVE 60

CRITERION-REFERENCED MEASURE

Questions

1. When heating metal to cherry red, regulate both gases to ______________ pounds.
   a. 25
   b. 7
   c. 15
   d 2
2. To bend metal, use a number 5 or 7 ____________.
3. Cooling metal too ____________ makes it brittle.

Answers

1. b.
2. Tip
3. Fast

Practical Application

The students will form metal using an oxyacetylene torch to repair farm machinery in 30 minutes.

Method of Evaluating Practical Application

Use Checklist Performance Objective 60 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 60 EVALUATION

FORMING METAL USING OXYACETYLENE TORCH TO REPAIR FARM MACHINERY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Selected farm machinery to be repaired and secured safety equipment.		
2. Selected metal as near original thickness as possible to repair machinery in question.		
3. Selected No. 5 or No 7 tip. Regulated both oxygen and acetylene to approximately 7 pounds.		
4. Lighted torch and heated metal to a cherry red. Used pliers, vise, pipe wrench, hammers, etc., shape metal to original shape. (NOTE: Metal may have to be heated several times, bending it a little each time).		
5. Cooled metal and checked for fit. Welded into place.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 61

TASK

Install and remove tractor-mounted cultivator

STANDARD OF PERFORMANCE OF TASK

The cultivator must be securely attached, and the rockshaft control adjusted to the depth recommended for the crop being worked. When unhitching the cultivator, brakes must be locked, and hydraulic pressure released from arms.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operator: Agricultural Machinery Safety, pp. 164-166.**

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Operator's manual
Cultivator
Needed tools

ENABLING OBJECTIVES

1. Identify a tractor mounted cultivator
2. Identify hydraulic lines and hook-ups.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 334-335.

TEACHING ACTIVITIES

1. Discuss the different types of tractor hook-ups.
2. Discuss how plant root systems affect cultivator selection.
3. Have students complete the performance check list attached to the lesson.
4. Discuss proper tilt of the sweep.
5. Demonstrate how to measure row spacing.

CRITERION-REFERENCED MEASURE

Questions

1. The cultivator should always be checked for proper _______ spacing.
2. Cultivators are ___________ tillage equipment.
3. You should refer to your ___________ ______________ for proper hook-up.

PERFORMANCE OBJECTIVE 61

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Row
2. Secondary
3. Operator's manual

Practical Application

The student will install and remove tractor mounted cultivator in 1 hour using the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 61 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 61 EVALUATION

INSTALLING AND REMOVING TRACTOR CULTIVATOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Studied tractor operator's manual for correct procedure for installing and removing cultivator.		
2. Checked tractor and cultivator for completeness.		
3. Assembled needed tools and equipment.		
4. Followed steps outlined in operator's manual and installed or removed tractor-mounted cultivator.		
5. Checked adjustments and alignment of cultivator for proper row spacing.		
6. Insured hydraulic lines are properly connected or disconnected, whichever was applicable.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 62

TASK

Install and remove tractor-mounted mowers

STANDARD OF PERFORMANCE OF TASK

Mower should raise and lower, be horizontal to the surface being mowed, adjusted to the height of three inches, and securely attached to PTO.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor and mower
Operator's manual
Necessary tools

ENABLING OBJECTIVES

1. Identify the PTO shaft.
2. Identify the safety rules that apply to PTO use.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 377-383.

TEACHING ACTIVITIES

1. Discuss safety as it applies to the PTO.
2. Use transparencies to show the various types of mowers.
3. Demonstrate proper shoe and tilt adjustments.
4. Have the students complete the performance check list attached to this lesson.
5. Discuss how mower performance, based on proper installation, can affect hay quality.

CRITERION-REFERENCED MEASURE

Questions

1. The mower should raise to a height greater than _________
    a. 12
    b. 30
    c. 20
    d. 7
2. Before using the mower it is important to _____ all fittings.
3. It is important to hook up the mower on ______ ground.

PERFORMANCE OBJECTIVE 62

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. a
2. Grease
3. Level

Practical Application

The student will install and remove tractor-mounted mowers in 30 minutes, given the operator's manual.

Method of Evaluating Practical Application

Use Checklist Performance Objective 62 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 62 EVALUATION

INSTALLING AND REMOVING TRACTOR MOUNTED MOWERS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Positioned mower on level ground, backed tractor up, and connected hitch arms and stabilizer bars.		
2. Connected PTO shaft.		
3. Raised and lowered mower to determine proper operation. Mower should have been on ground level in down position and should have been raised to a height greater than 12 inches.		
4. Greased all fittings, and lubricated sickle bar as specified in operator's manual.		
5. Engaged PTO. Observed operation of sickle bar. For proper register, the sections should have been traveling from center of one guard to center of next guard. The outer end of the cutter bar should be ahead of the inner end approximately 1/4 inch for each foot of cutter bar length.		
6. Removed mower in reverse order making sure ground is level.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 63

TASK

Mount SLOW MOVING VEHICLE emblems on farm machinery

STANDARD OF PERFORMANCE OF TASK

Emblem must be securely fastened and placed in a position easily identified by oncoming traffic. All state motor vehicle guidelines pertaining to the emblem must be met.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety,** pp. 167-168.

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery
SLOW MOVING VEHICLE emblem
Necessary tools and equipment

ENABLING OBJECTIVES

1. Identify the purpose of the SLOW MOVING VEHICLE sign.
2. Use common hand and power tools.

RESOURCE

State motor vehicle guideline for farm equipment.

TEACHING ACTIVITIES

1. Review the purpose of the SMV sign.
2. Discuss the importance of sign placement.
3. Discuss the state requirements for the SMV sign.
4. Demonstrate the steps in the performance guide.
5. Have students complete criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. The SMV sign should not be placed on farm ______________.
2. SMV signs should be mounted ______ enough to be seen by traffic as it comes over a hill.
3. The SMV sign should ____________ vary.

PERFORMANCE OBJECTIVE 63

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Trucks
2. High
3. Not

Practical Application

The student will mount a SLOW MOVING VEHICLE emblem on farm machinery in one hour using the needed tools.

Method of Evaluating Practical Application

Use Checklist Performance Objective 63 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 63 EVALUATION

MOUNTING "SLOW-MOVING VEHICLE" EMBLEMS ON FARM MACHINERY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained SLOW MOVING VEHICLE emblem, necessary tools and equipment, and state motor vehicle requirements.		
2. Located a position on the farm machinery for mounting the emblem that conforms to state requirements.		
3. Mounted the SLOW MOVING VEHICLE emblem .		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 64

TASK

Patch broken sheet metal on farm machinery by riveting

STANDARD OF PERFORMANCE OF TASK

The patch on the repaired machinery must be firmly attached and be as strong as original metal.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery in need of repair
Necessary tool
Supplies

ENABLING OBJECTIVES

1. Identify a rivet.
2. Identify drill bit sizes.

RESOURCE

Wakeman. **The Farm Shop**, p. 204.

TEACHING ACTIVITIES

1. Show the various types of rivets.
2. Discuss the uses of rivets.
3. Discuss drill size selection.
4. Have students complete the performance checklist attached to this lesson.
5. Have students complete the criterion-referenced questions.

PERFORMANCE OBJECTIVE 64

CRITERION-REFERENCED MEASURE

Questions

1. When riveting, the drill should be the size of the _______________.
2. After inserting rivets you must next ____________ them.
3. The sheet metal being repaired should be ___________ to remove rust and ___________ to reduce rust.

Answers

1. Rivet
2. Hammer
3. Sanded/painted

Practical Application

The student will patch broken sheet metal on farm machinery by riveting in one hour.

Method of Evaluating Practical Application

Use Checklist Performance Objective 64 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 64 EVALUATION

PATCHING BROKEN SHEET METAL ON FARM MACHINERY BY RIVETING

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Assembled necessary tools and supplies.		
2. Cleaned area to be patched.		
3. Placed sheet metal patch and predrilled holes.		
4. Repaired the broken sheet metal by inserting rivets and hammered down.		
5. Checked the patched area for strength and appearance.		
6. Sanded and painted patched area.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 65

TASK

Patch broken sheet metal on farm machinery by soldering

STANDARD OF PERFORMANCE OF TASK

The repaired metal must be firmly attached, soldered smoothly without holes, and be as strong as the original metal.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with broken sheet metal
The necessary tools
Supplies.

ENABLING OBJECTIVES

1. Demonstrate the ability to paint metal.
2. Demonstrate the ability to use a propane torch.

RESOURCE

Wakeman. **The Farm Shop**, pp. 193-209.

TEACHING ACTIVITIES

1. Explain the importance of heating the metal to be soldered.
2. Allow students to practice soldering on scrap sheet metal.
3. Review the section in the textbook on soldering. pp. 193-209.
4. Explain the need for having the metals, to be soldered, clean.
5. Have students complete the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Both metals must be ______ before you apply the solder.
2. ___________ metals cannot be successfully soldered.
    a. Greasy
    b. Dirty
    c. Both a & b
3. Both metals should be _________ in order to get a good solder.
    a. Touching
    b. Painted
    c. New

PERFORMANCE OBJECTIVE 65

CRITERION-REFERENCED MEASURE(Continued)

Answers

1. Heated
2. c
3. a

Practical Application

Have students repair broken sheet metal on a given tractor using the performance guide in one hour.

Method of Evaluating Practical Application

Use Checklist Performance Objective 65 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 65 EVALUATION

PATCHING BROKEN SHEET METAL ON FARM MACHINERY BY SOLDERING

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Assembled necessary tools, supplies, and safety equipment.		
2. Cleaned areas to be patched.		
3. Positioned sheet metal patch.		
4. Heated the edge of patch and edge of equipment touching the patch.		
5. Applied solder to the preheated edges.		
6. Used soldering iron to fuse solder into the edges of the metals.		
7. Checked the soldered joint for strength and/or appearance.		
8. Painted patched area.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 66

TASK

Purge diesel fuel system (bleed air from lines)

STANDARD OF PERFORMANCE OF TASK

The tractor should start after one minute of cranking and run without a miss.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A diesel tractor
Operator's manual
Tools

ENABLING OBJECTIVES

1. Identify the injection pump and injection lines.
2. Use an owner's manual.

RESOURCES

1. Jacobs, et al. **Agricultural Power and Machinery**, pp. 209-210.
2. **Operator's Manual for John Deer 950 Tractor**.

TEACHING ACTIVITIES

1. Review the fuel injection system on a diesel engine.
2. Discuss how air in the line reduces engine performance and efficiency.
3. Have students read and discuss the textbook, **Agricultural Power and Machinery**, pp. 209-210.
4. Demonstrate the steps in the performance guide.
5. Have students complete criterion-referenced questions.

CRITERION-REFERENCED MEASURE CONTINUED

Questions

1. Some tractors require special ____________ to prevent damage to the injection lines.
2. The line must be bled until fuel flows without ____________.
3. Pressure on the fuel line may exceed psi, therefore you must be particularly careful for this is enough to penetrate your __________.

PERFORMANCE OBJECTIVE 66

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Wrenches
2. Foam
3. Skin

Practical Application

Have students purge a diesel fuel system.

Method of Evaluating Practical Application

Use Checklist Performance Objective 66 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 66 EVALUATION

PURGING THE DIESEL FUEL SYSTEM

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Checked level of fuel in tank. It should be at least 1/4 full.		
2. Located air bleed points in fuel system as outlined in service manual.		
3. Starting with No. 1 point, opened valve or loosened (whichever is necessary) bled fuel pump by hand until no bubbles were in the fuel. Tightened valve or connection and proceeded to other bleed points progressively as outlined in service manual.		
4. Wiped off any accumulation of diesel fuel on engine.		
5. Started engine and ran at approximately 800 RPM for one minute.		
6. Checked for any leaks.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY

PERFORMANCE OBJECTIVE 67

TASK

Rebuild carburetor using small parts kit

STANDARD OF PERFORMANCE OF TASK

There should be no fuel leaks in the carburetor, idling, or under load. The engine should idle and run smoothly under load.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An assorted set of end wrenches
Carburetor small parts kit
Operator's manual
Screwdrivers
Needle nose pliers
Carburetor cleaner
A dynamometer

ENABLING OBJECTIVES

1. Identify the basic types of carburetors.
2. Identify and use the given tools.

RESOURCE

Operator's Manual for 1985 John Deere 950 Tractor.

TEACHING ACTIVITIES

1. Discuss and outline the parts and purpose of a carburetor.
2. Discuss what the usual problems are with a float type carburetor.
3. Demonstrate how to adjust the idle on the tractor.
4. Demonstrate how to use the dynamometer.
5. Allow students to do the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. The ___________ rises to cut off fuel supply to the carburetor.
    a. oil
    b. jet
    c. float
    d. none of these

PERFORMANCE OBJECTIVE 67

Criterion-Referenced Measure (Continued)

2. When we remove the carburetor from the cleaning solution, we wash it in ____________ .
   a. gas
   b. oil
   c. cold water
   d. hot water
3. When repairing a carburetor, we usually replace the _______ .
   a. jets
   b. float
   c. needle
   d. none of these.

Answers

1. c
2. d
3. a

Practical Application

Have students rebuild carburetor using small parts kit.

Method of Evaluating Practical Application

Use Checklist Performance Objective 67 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 67 EVALUATION

REBUILDING CARBURETOR USING SMALL PARTS

Student's Name Date

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Turned off fuel supply and removed carburetor from engine.		
2. Removed screws from top of carburetor; removed carburetor float, needle, seat, and gasket from top half of carburetor.		
3. Placed the top and bottom halves of the carburetor into a can of carburetor-cleaning solution. Let stand for at least four hours.		
4. Removed carburetor from cleaning solution and washed thoroughly with very hot water.		
5. Took air hose and blew remaining water from the parts. Was sure to blow into all holes and corners.		
6. Removed each jet, one-at-a-time and replaced with a new one following service bulletin and instructions. Removed throttle shaft and bushings and replaced with new one. Followed the same procedure for the remaining new parts. After all new parts were installed and float height adjusted, reassembled carburetor.		
7. Installed reassembled carburetor on engine. Started engine and let run until reaching operating temperature. Made final idle adjustment.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 67 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
8. Connected tractor to dynamometer and set load screw to specifications.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 68

TASK

Refuel farm machinery

STANDARD OF PERFORMANCE OF TASK

The farm machinery will be refueled with the proper type of fuel, and no fuel will be spilled on engine, manifold, exhaust, or electrical system. No water or debris will enter the system. All OSHA regulations concerning the refueling of farm machinery will be followed.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A farm machine
Necessary fuel
Refuel the farm machinery

ENABLING OBJECTIVES

1. Identify diesel fuel.
2. Identify fuel tank.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, p. 195-200.

TEACHING ACTIVITIES

1. Discuss the types of fuels tractors run on and how they rate in terms of efficiency.
2. Discuss the textbook, **Agricultural Power and Machinery**, pp. 195-200.
3. Review safety rules for handling flammables.
4. Review the types of pumps found on the farm.
5. Allow students to do the criterion-referenced questions.

PERFORMANCE OBJECTIVE 68

CRITERION-REFERENCED MEASURE

Questions

1. Be sure the tractor is not ____________ when filling.
2. Always replace the tank ____________ after refueling.
3. Most farm tractors run off on ____________ fuel due to fuel efficiency.

Answers

1. Running
2. Cap
3. Diesel

Practical Application

Have students refuel farm machinery.

Method of Evaluating Practical Application

Use Checklist Performance Objective 68 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 68 EVALUATION

REFUELING FARM MACHINERY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Located and identified fuel storage tank containing fuel. (NOTE: Do not refuel near sparks or flame).		
2. Located fuel tank cap on tractor.		
3. Cleaned around tank cap on tractor.		
4. Inserted fuel nozzle into tank opening and filled. Did not run over.		
5. Replaced tank cap securely.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 69

TASK

Remove and replace defective machinery guards and shields

STANDARD OF PERFORMANCE OF TASK

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor or particular piece of machinery
Operator's manual
Tools

ENABLING OBJECTIVES

1. Identify a guard.
2. Identify a shield.

RESOURCE

Operator's Manual for 1985 John Deer 950 Tractor.

TEACHING ACTIVITIES

1. Review the importance of safety shields and guards on equipment.
2. Given examples of accidents that may have occurred in the community due to perhaps a missing PTO guard.
3. Demonstrate the steps in the performance guide.
4. Allow the student to do the steps in the performance evaluation.
5. Allow students to complete the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. Faulty guards and shields should be ___________.
2. Shields must give adequate protection while not __________ with operation of the equipment.
3. Consult your operator's ____________ for location of all guards and shields.

Answers

1. Replaced
2. Interfering
3. Manual.

PERFORMANCE OBJECTIVE 69

CRITERION-REFERENCED MEASURE (Continued)

Practical Application

Have students remove and replace defective machinery guards and shields.

Method of Evaluating Practical Application

Use Checklist Performance Objective 69 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 69 EVALUATION

REMOVING AND REPLACING DEFECTIVE MACHINERY GUARDS AND SHIELDS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Consulted operator's manual for location of all guards and shields		
2. Checked all locations to make sure that guards or shields provided adequate protection for the operator and did not interfere with the proper operation of the machinery.		
3. Removed and replaced defective guards and shields.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 70

TASK

Remove or add ballast weights to tractor

STANDARD OF PERFORMANCE OF TASK

The weights must be bolted securely in place with no excessive movement when attached.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with ballast weights
Necessary tools
Weights
Manual

ENABLING OBJECTIVES

1. Identify ballast weights.
2. Identify tools.

RESOURCE

Operator's Manual for a 1985 John Deer 950 Tractor.

TEACHING ACTIVITIES

1. Discuss the purpose of ballast weights.
2. Demonstrate the proper way to lift heavy objects so that you prevent back injury.
3. Outline the advantages of iron vs. liquid weights.
4. Demonstrate the steps in the performance evaluation.
5. Allow students to complete the criterion-referenced questions.

PERFORMANCE OBJECTIVE 70

CRITERION-REFERENCED MEASURE

Questions

1. Ballast weights must be ____________ in place securely.
2. Added weights can be either iron or ___________.
3. Lifting weights can result in ____________ injury if safety rules are not followed.

Answers

1. Bolted
2. Liquid
3. Back

Practical Application

Removing or adding ballast weights to tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 70 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 70 EVALUATION

REMOVING OR ADDING BALLAST WEIGHTS TO TRACTOR

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Assembled necessary tools, ballast weights, etc.		
3. Followed directions in manual in removing or adding ballast weights. (NOTE: Added weight can be either iron or liquid).		
4. Secured the weights.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 71

TASK

Repair tire by patching

STANDARD OF PERFORMANCE OF TASK

When inflated to manufacturer's specifications, the tire will not leak.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tire
Necessary supplies

ENABLING OBJECTIVES

1. Identify tire and tube.
2. Identify tire repair tools.

RESOURCE

Operator's manual for John Deer 950 Tractor.

TEACHING ACTIVITIES

1. Show students how to locate puncture in tire by using soapy water.
2. Go over safety rules for inflating large tires.
3. Demonstrate the steps for patching a tire and or tube.
4. Discuss manufacturer's specifications for inflating the given tire.
5. Allow students to complete the criterion-referenced questions.

CRITERION-REFERENCED MEASURE

Questions

1. You can locate a puncture with __________ water.
2. After you find the puncture, you need to ___________ the area around the puncture.
3. After applying the adhesive and patch you must apply ________.

Answers

1. Soapy
2. Clean
3. Heat

PERFORMANCE OBJECTIVE 71

CRITERION-REFERENCED MEASURE (Continued)

Practical Application

Have students repair tires by patching.

Method of Evaluating Practical Application

Use Checklist Performance Objective 71 to determine if the assignment was completed with 100 accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 71 EVALUATION

REPAIRING TIRE BY PATCHING

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual.		
2. Selected tools and supplies.		
3. Located puncture in tire.		
4. Removed tire from rim.		
5. Cleaned area around puncture.		
6. Applied adhesive, patch, and heat.		
7. Smoothed patch out (removed air by rolling).		
8. Replaced tire (and tube unless tubeless) onto rim, being careful not to pinch tube.		
9. Inflated to manufacturer's specifications.		
10. Checked for leaks.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 72

TASK

Replace alternator

STANDARD OF PERFORMANCE OF TASK

The alternator must be securely mounted with all electrical leads fastened to the proper terminals.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with a defective alternator
Proper tools
Equipment
Supplies

ENABLING OBJECTIVES

1. Identify all relative safety procedures.
2. Recognize the alternator on the tractor.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 4, p. 42.

TEACHING ACTIVITIES

1. Have students discuss **Fundamentals of Service - Electrical Systems**, Chapter 4, p. 42.
2. Identify all tools needed for this activity.
3. Identify all alternator leads which must be disconnected.
4. Demonstrate the proper way to tighten the drive belt.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. What is the function of the alternator?
2. What are some factors which determine alternator design?
3. Where would you find how much tension to put on the alternator belt?

PERFORMANCE OBJECTIVE 72

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. To supply current to charge the battery and operate electrical accessories.
2. Type of mounting, vibration, belt loading, rotor speeds, current output, service life required, environmental factors such as dirt and dust.
3. In the operator's manual.

Practical Application

The student will properly replace the alternator on a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 72 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 72 EVALUATION

REPLACING ALTERNATOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1 Secured necessary tools, equipment, and supplies.		
2. Secured proper replacement alternator.		
3. Disconnected battery lead from battery terminal.		
4. Labeled all leads if necessary.		
5. Disconnected all leads at alternator and removed.		
6. Replaced alternator and lead wires as they were. Tightened drive belt to proper tension.		
7. Reconnected battery lead to terminal.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 73

TASK

Replace auxiliary lights

STANDARD OF PERFORMANCE OF TASK

The auxiliary lights will function when the light switch is turned on.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS OF PERFORMANCE OF TASK

A tractor
Tools
Lights
Wire
Wire connectors

ENABLING OBJECTIVES

1. Interpret common electrical terms, such as volt, amp, conductor, switch, etc.
2. Read and interpret the operator's manual.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, p. 6.

TEACHING ACTIVITIES

1. Read and discuss pp. 1-6 of Chapter 7 in **Fundamentals of Service - Electrical Systems**.
2. The teacher will demonstrate the proper use of crimping pliers.
3. The teacher will demonstrate the proper use of solderless connectors.
4. The teacher will discuss the importance of a good ground.
5. The teacher will have the student complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What powers the auxiliary lights?
2. What may cause an auxiliary light to fail?
3. What should you always do when replacing light bulbs?

PERFORMANCE OBJECTIVE 73

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. The battery and generator/alternator.
2. Defective light, broken or disconnected wire, corroded connection, or failed switch.
3. Make sure the replacement bulb is of the same style and part number as the old one.

Practical Application

The student will properly replace the auxiliary lights on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 73 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 73 EVALUATION

REPLACING AUXILIARY LIGHTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Removed old lights by loosening hold-down nut and cutting wire.		
2. Connected wire of new lights to old existing wire using solderless connectors and crimping pliers.		
3. Ground existing position for new lights to insure a solid ground.		
4. Installed new light and tightened hold-down nut.		
5. Checked lights for proper operation.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 74

TASK

Replace battery

STANDARD OF PERFORMANCE OF TASK

Battery must be secured with battery cables connected to proper terminals. Tractor must start.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with defective battery
Tools
Shop rags
Replacement battery
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 3, pp. 1-20.

TEACHING ACTIVITIES

1. Have students read and discuss highlights of Chapter 3 in **Fundamentals of Service - Electrical Systems.**
2. Discuss the importance of clean battery connections.
3. Discuss the proper handling of the battery.
4. Demonstrate the steps in the performance guide.
5. Orally question the students about the proper way of installing a replacement battery.

CRITERION-REFERENCED MEASURE

Questions

1. Which terminal on the battery is usually larger, positive or negative?
2. The electrolite in the battery is composed of water (H_2O) and ______.
3. Which cable do you disconnect first? Why?

PERFORMANCE OBJECTIVE 74

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Positive
2. Sulfuric Acid (H_2SO_4)
3. Ground cable, to avoid chance of sparking.

Practical Application

The student will properly replace the battery on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 74 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 74 EVALUATION

REPLACING BATTERY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Obtained shop rags, necessary tools, replacement battery, and operator's manual.		
2. Disconnected battery cable. (NOTE: Disconnect ground cable first to reduce the chance of sparking on tools).		
3. Removed battery hold-down clamp.		
4. Removed battery.		
5. Checked for worn or frayed battery cables.		
6. Cleaned battery cable terminals.		
7. Cleaned battery hold-down brackets and mounting box.		
8. Installed new battery.		
9. Connected battery cable to battery posts and tightened. (NOTE: To avoid damage to the battery and electrical system be sure the proper cable is secured to the right battery terminal).		
10. Installed battery hold-down bracket and secured.		
11. Started tractor engine.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 75

TASK

Replace exhaust pipes and mufflers

STANDARD OF PERFORMANCE OF TASK

Exhaust pipe and muffler must be securely fastened and have no exhaust leaks. The system must pass state inspection requirements pertaining to the vehicle.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with a defective exhaust system
Necessary tools,
Replacement parts

ENABLING OBJECTIVES

1. Identify all relative safety procedures.
2. Read and interpret the operator's manual.

RESOURCE

Fundamentals of Engines, Chapter 6, pp. 12-13.

TEACHING ACTIVITIES

1. The teacher will discuss techniques for removing old exhaust pipes and muffler.
2. The teacher will discuss how to check for exhaust leaks.
3. The teacher will demonstrate how to maintain proper ventilation.
4. Read and discuss **Fundamentals of Service - Engines**, Chapter 6, pp. 12-13.

CRITERION-REFERENCED MEASURE

Questions

1. Name 3 things the exhaust system does.
2. What are the 2 common types of mufflers?
3. What is the poisonous gas which passes through the exhaust system?

PERFORMANCE OBJECTIVE 75

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Removes heat, muffles engine sounds, carries away burned and unburned gases.
2. Straight - through, reverse - flow
3. Carbon monoxide

Practical Application

The students will replace exhaust pipes and mufflers on a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 75 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 75 EVALUATION

REPLACING EXHAUST PIPES AND MUFFLERS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Assembled replacement exhaust pipe(s) and muffler(s).		
2. Assembled necessary tools and equipment.		
3. Removed old, defective parts.		
4. Installed new exhaust pipes and mufflers.		
5. Reattached any support brackets that may have held exhaust pipe or muffler in place.		
6. Started engine and checked system for leaks.		
7. Maintained proper ventilation.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 76

TASK

Replace flasher light bulbs

STANDARD OF PERFORMANCE OF TASK

Bulb must be replaced with proper replacement bulb, and light must operate.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with a defective flasher bulb
Tools
Shop rags
Replacement bulb
Necessary equipment

ENABLING OBJECTIVES

1. Read and interpret the operator's manual, and part numbers on bulbs.
2. Interpret common electrical terms such as volt, amp, switch, etc.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, pp. 1-6.

TEACHING ACTIVITIES

1. Read and discuss pp. 1-6 of Chapter 7 in **Fundamentals of Service - Electrical System**.
2. The teacher will discuss the importance of using the correct replacement bulb.
3. The teacher will discuss removing the old bulb so as not to break it in it's socket.
4. The teacher will discuss removing and replacing the flasher unit lens so as not to break or damage it.
5. The teacher will have the student complete the performance checklist attached to this lesson.

PERFORMANCE OBJECTIVE 76

CRITERION-REFERENCED MEASURE

Questions

1. What might happen if you replace a bulb with one of another style and part number?
2. What powers the flasher lights?
3. What should you always do when replacing a flasher light bulb?

Answers

1. The lighting system could be damaged or the bulb could burn out rapidly.
2. The battery and generator/alternator.
3. Make sure the replacement and old bulbs are of the same style and part number.

Practical Application

The student will properly replace a flasher light bulb.

Method of Evaluating Practical Application

Use Checklist Performance Objective 76 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 76 EVALUATION

REPLACING FLASHER LIGHT BULBS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained necessary tools, replacement bulb, and operator's manual.		
2. Removed flasher light lens to defective flasher bulb.		
3. Removed defective flasher bulb. (NOTE: Bulb can be removed by applying pressure and turning counterclockwise).		
4. Checked part number on replacement bulb with defective bulb.		
5. Inserted new bulb by applying pressure and turning clockwise.		
6. Checked to see if replacement bulb was operating properly.		
7. Cleaned and replaced flasher unit lens.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 77

TASK

Replace flasher unit

STANDARD OF PERFORMANCE OF TASK

New unit must be securely fastened and all electrical leads secured. Flasher unit should send a minimum of 20-30 impulses per minute.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with a defective flasher unit
New unit

ENABLING OBJECTIVES

1. Read and interpret any written directions which are given.
2. Interpret common electrical terms such as volt, amp, impulses per second, etc.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, pp. 1-5.

TEACHING ACTIVITIES

1. Read and discuss pp. 1-5 in **Fundamentals of Service - Electrical Systems.**
2. The teacher will discuss the importance of reconnecting the proper wires.
3. The teacher will demonstrate methods of marking wires for proper hook up.
4. The teacher will discuss the proper way to connect the wires to the unit.
5. The teacher will have the student complete the performance checklist attached to this sheet.

PERFORMANCE OBJECTIVE 77

CRITERION-REFERENCED MEASURE

Questions

1. Why must the new flasher unit be securely attached to the tractor?
2. Will a flasher unit work properly with loosely connected electrical leads?
3. What does the term "impulses per minute" refer to?

Answers

1. To prevent it from coming loose.
2. No - Because this will cause a break in the electrical circuit.
3. How many times the light receives an electrical impulse to flash in a minute (flashes of the light per minute).

Practical Application

The student will properly replace the flasher unit on a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 77 to determine if the assignment was competed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 77 EVALUATION

REPLACING FLASHER UNIT

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Assembled needed tools.		
2. Read any directions that may have come with new unit.		
3. Removed wires from old unit.		
4. Removed old unit		
5. Installed new unit		
6. Connected wires to new unit.		
7. Tested unit for operation.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 78

TASK

Replace front wheel

STANDARD OF PERFORMANCE OF TASK

The replaced wheel should be firmly attached with all nuts secured and hub in place.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Jack
Wheel stand
Wheel and tools

ENABLING OBJECTIVES

1. Read and understand the operator's manual.
2. Identify all relative safety practices.

RESOURCE

Tractor Maintenance, pp. 39-43.

TEACHING ACTIVITIES

1. The teacher will discuss OSHA jacking procedures.
2. The teacher will discuss selecting the right jack for the job.
3. The teacher will discuss the proper way to start lug bolts without cross-threading them.
4. The teacher will have the students complete the criterion-referenced questions listed.
5. The teacher will have the students complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. Why is it important to place the tractor on level ground?
2. Why are the rear brakes locked?
3. What can you do to prevent cross-threading the lug bolts?

PERFORMANCE OBJECTIVE 78

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. To reduce the risk of rolling or overturn while the front wheel is off.
2. To prevent the tractor from rolling off the jack.
3. Hand start all bolts at least two complete turns.

Practical Application

The student will replace a front wheel on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 78 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 78 EVALUATION

REPLACING FRONT WHEEL

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual.		
2. Selected proper tools and equipment.		
3. Placed tractor on level ground.		
4. Locked brakes on rear wheels. (NOTE: OSHA jacking procedures must be followed).		
5. Placed jack under front wheel and raised until tire just touched ground.		
6. Loosened wheel nuts and removed the wheel.		
7. Installed wheel nuts and reversed procedure.		
8. Removed jack.		
9. Checked wheel nuts for tightness.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 79

TASK

Replace fuel line

STANDARD OF PERFORMANCE OF TASK

New fuel line should not leak. The new fuel line must meet manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with leaking or collapsed fuel line,
Tools
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Engine, Chapter 5, pp. 3-4.

TEACHING ACTIVITIES

1. The teacher will discuss the possibility of disconnecting the battery to reduce the chance of accidental sparking and fire.
2. The teacher will discuss the importance of not cross-threading the flare nuts.
3. The teacher will discuss the importance of not over-tightening the flare nuts.
4. Read and discuss chapter 5, pp. 3-4 in **Fundamentals of Service - Engines**.
5. The teacher will have the student complete the performance checklist attached to this sheet.

CRITERION-REFERENCED MEASURE

Questions

1. Not disconnecting the battery before working on the fuel line can lead to ______________.
2. Which fuel is easier to ignite from a spark, gasoline or diesel?
3. Over-tightening or cross-threading flare nuts may cause ______.

PERFORMANCE OBJECTIVE 79

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Fire
2. Gasoline
3. Leaks

Practical Application

The student will properly replace the fuel line on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 79 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 79 EVALUATION

REPLACING FUEL LINE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Shut off fuel supply.		
2. Located leaking fuel line and removed rising flare nut using wrenches of proper size.		
3. Obtained new line.		
4. Using flare nut wrenches, tightened flare nuts on both ends of the line in their position - DO NOT OVER-TIGHTEN.		
5. Turned gas on and checked for leaks.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 80

TASK

Replace generator

STANDARD OF PERFORMANCE OF TASK

New generator must be securely mounted and meet manufacturer's specifications on belt tension. All wires must be tight and fastened to proper terminal, and generator must be polarized.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An engine with defective generator
Operator's manual
Tools
Voltmeter
New Generator

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify the generator on the tractor.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 4, pp. 1-19.

TEACHING ACTIVITIES

1. The teacher will discuss labeling leads for proper hook-up.
2. The teacher will discuss generator belt damage and when to replace belts.
3. The teacher will demonstrate the proper way to check belt tension.
4. The teacher will have the student complete the criterion-referenced questions listed below.
5. The teacher will have the students complete the performance checklist attached to this sheet.

CRITERION-REFERENCED MEASURE

Questions

1. What is the purpose of the generator?
2. The generator produces ____________ current.
3. ________________ is the direction of current flow through the generator.

PERFORMANCE OBJECTIVE 80

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. To produce electrical power.
2. Direct
3. Polarity

Practical Application

The student will properly replace a generator on an engine.

Method of Evaluating Practical Application

Use Checklist Performance Objective 80 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 80 EVALUATION

REPLACING A GENERATOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Secured necessary tools, equipment, supplies, and operator's manual.		
2. Secured proper replacement generator.		
3. Disconnected all generator leads and labeled if necessary.		
4. Removed old generator from engine.		
5. Inspected generator belt for damage. (Replaced if necessary).		
6. Installed new generator and tightened to proper belt tension.		
7. Reconnected generator leads properly.		
8. Polarized generator according to service manual.(Externally grounded = battery to generator or (Internally grounded = battery to field).		
9. Started engine and checked generator voltage.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 81

TASK

Replace headlights

STANDARD OF PERFORMANCE OF TASK

The headlight bulb must be replaced, and both high and low beams must function. Headlight adjustment must meet state inspection requirements.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a defective headlight bulb
Necessary tools
Headlight aimer
Operator's manual
Replacement headlight bulb

ENABLING OBJECTIVES

1. Interpret common electrical terms such as volt., amp., etc.
2. Read and interpret the operator's manual.

RESOURCE

Fundamentals of Science - Electrical Systems, Chapter 7. pp. 1-3.

TEACHING ACTIVITIES

1. Read and discuss pp. 1-3 of chapter 7 in **Fundamentals of Service - Electrical Systems.**
2. The teacher will demonstrate the proper way to connect a "pigtail."
3. The teacher will discuss state inspection requirements for headlights.
4. The teacher will demonstrate the proper use of the headlights aimer.
5. The teacher will have the student complete the performance checklist attached to this sheet.

CRITERION-REFERENCED MEASURE

Questions

1. (True or False) Headlights should be adjusted so the glare of the lights will not shine into the eyes of approaching driver. Why?
2. What holds the headlight in place?
3. What must be loosened to adjust the position of the headlight bulb?

PERFORMANCE OBJECTIVE 81

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. True - Because it may 'blind' an approaching driver and cause an accident.
2. The headlight bulb retainer ring.
3. The headlight bulb retainer ring.

Practical Application

The student will properly replace and aim the headlight on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 81 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 81 EVALUATION

REPLACING HEADLIGHTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools, shop rags, replacement headlight bulb, and operator's manual.		
2. Removed headlight support rim.		
3. Loosened headlight adjustment screws.		
4. Removed defective headlight bulb, and disconnected electrical "pigtail" from the back of the bulb.		
5. Installed new headlight bulb and connected "pigtail."		
6. Placed vehicle on level surface with wheels straight ahead.		
7. Adjusted high and low beam of headlights in accordance with manufacturer's specifications to meet state inspection requirement.		
8. Replaced headlight bulb retainer ring and secured.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 82

TASK

Replace oil pressure gauge

STANDARD OF PERFORMANCE OF TASK

If pressure line extends to gauge, there should be no leaks. Gauge must be functional.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An engine with defective oil gauge
New gauge
Tools

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety practices.

RESOURCE

Fundamentals of Service - Engines, Chapter 7, pp. 12-14.

TEACHING ACTIVITIES

1. Read and discuss pp. 12-14 in chapter 7 in **Fundamentals of Service - Engines**.
2. The teacher will discuss the function and importance of oil.
3. The teacher will discuss the function of the oil pressure gauge.
4. The teacher will discuss how to check the new gauge for proper operation.
5. The teacher will have the student complete the performance checklist attached to this sheet.

PERFORMANCE OBJECTIVE 82

CRITERION-REFERENCED MEASURE

Questions

1. How can you test a gauge to see if it is defective?
2. What are two types of oil pressure indicating systems?
3. Where would you look to find the proper operating oil pressure for a tractor?

Answers

1. Replace it with a new one. If the new gauge works, then the old one was defective.
2. Mechanical, Electrical
3. The operator's manual.

Practical Application

The student will properly replace an oil pressure gauge on an engine.

Method of Evaluating Practical Application

Use Checklist Performance Objective 82 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 82 EVALUATION

REPLACING AN OIL PRESSURE GAUGE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual.		
2. Assembled needed tools and new oil pressure gauge.		
3. Removed oil gauge after disconnecting tube or electrical line attached.		
4. Installed new gauge and reconnected tube or line.		
5. Ran engine and checked fitting for leaks (if pressure line goes to gauge).		
6. Checked proper function of new gauge.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 83

TASK

Replace rear wheel

STANDARD OF PERFORMANCE OF TASK

Tires should be traveling in correct direction, wheel spacing should be as required for the task to be done, and the wheel nuts torqued to 175 foot pounds.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Jacks
Wheel stand
Tools

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Tractor Maintenance, pp. 39-43.

TEACHING ACTIVITIES

1. The teacher will discuss OSHA jacking procedures.
2. The teacher will discuss proper jack selection.
3. The teacher will demonstrate the proper use of the torque wrench.
4. The teacher will have the student complete the criterion-referenced questions listed below.
5. The teacher will have the student complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. Where would you find information about the removal procedure for a particular tractor?
2. A ________ ________ is used to measure how much you tighten the wheel nuts.
3. What is the formula for torque?

PERFORMANCE OBJECTIVE 83

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. The operator's manual.
2. Torque wrench
3. Torque = Force X Lever arm

Practical Application

The student will replace the rear wheel of a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 83 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 83 EVALUATION

REPLACING REAR WHEEL

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Placed jack under tractor and raised until tire just touched ground.		
2. Loosened wheel nuts. Consulted operator's manual for removal procedure. (Removal procedure differs for most tractors). a. Removed wheel nuts b. Removed the wheel.		
3. Installed wheel in reverse procedure. (NOTE: OSHA jacking procedures must be followed).		
4. Repeated procedure for left wheel.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 84

TASK

Replace starter

STANDARD OF PERFORMANCE OF TASK

Replacement starter must be the one designated for the vehicle and must be mounted with all electrical leads connected to the proper terminal.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle
The necessary tools
Equipment
Operator's manual

ENABLING OBJECTIVES

1. Identify all relative safety procedures.
2. Read and interpret the operator's manual.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 5, pp. 1-22.

TEACHING ACTIVITIES

1. Have students read and discuss **Fundamentals of Service -Electrical** Chapter 5, pp. 1-22.
2. Discuss the importance of removing the positive battery cable from the battery terminal.
3. Identify ways to mark starter wires and terminals for proper hook-up.
4. Demonstrate how to perform the starter draw test.
5. Have the students complete the performance checklist attached to this sheet.

CRITERION-REFERENCED MEASURE

Questions

1. The __________ converts electrical energy from the battery in to mechanical energy to crank the engine.
2. Why is the positive battery cable disconnected from the battery terminal?
3. The __________ causes the pinion gear to engage the flywheel.

PERFORMANCE OBJECTIVE 84

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Starter
2. To prevent sparking and the possibility of fire when disconnecting starter wires.
3. Solenoid

Practical Application

The student will properly replace the starter on a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 84 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 84 EVALUATION

REPLACING A STARTER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Removed positive (+) battery cable from battery terminal.		
2. Disconnected electrical leads on the starter.		
3. Removed the starter.		
4. Installed starter to starter mounting bolts using the necessary tools.		
5. Consulted manufacturer's installation procedure for wiring hook-up if necessary.		
6. Installed positive (+) battery cable at battery terminal.		
7. Performed starter draw test in accordance with manufacturer's specifications.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 85

TASK

Replace starter solenoid

STANDARD OF PERFORMANCE OF TASK

The disassembly and reassembly order will follow the steps outlined in the service manual. There will be no damage to any parts, and the solenoid will operate according to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

The necessary replacement parts
An operator's manual
Mechanic's tool set

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Use a tap.

RESOURCE

Fundamentals of Service - Electrical System, Chapter 5, pp. 11-12.

TEACHING ACTIVITIES

1. Discuss the function of the solenoid.
2. Discuss the types of solenoid switches.
3. Exhibit a coaxial and an external mounted solenoid starter.
4. Have the students complete the criterion-referenced questions listed.
5. Demonstrate the steps listed in the performance guide.

PERFORMANCE OBJECTIVE 85

CRITERION-REFERENCED MEASURE

Questions

1. The coaxial-mounted solenoid switch is on the ___________ of the starter motor housing.
2. Starter solenoid switches are mounted in what two ways?
3. What type of solenoid switch are you dealing with in this lesson?

Answers

1. Inside
2. Coaxial and external mounting
3. Coaxial mounted.

Practical Application

The student will properly replace a starter solenoid.

Method of Evaluating Practical Application

Use Checklist Performance Objective 85 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 85 EVALUATION

REPLACING STARTER SOLENOID

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Removed the starter components as outlined in the operator's manual, identifying parts during disassembly to facilitate reassembly.		
2. Unsoldered the contact post from the field coil connecting strap, using a heavy duty soldering iron or a small flame propane torch.		
3. Cut off the head of the contact spring retaining rivet with a sharp chisel and threw away the contact spring. (Use an 8/32 inch N.C. tap to cut threads in the rivet hole).		
4. Removed the contact post retaining screw and insulating washer; discarded both.		
5. Put the new contact spring and ground brush assembly, paper insulator, and contact post in position on the starter frame.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 85 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
6. Installed the insulating washer and retaining screw. Centered the contact points and tightened the retaining screw securely. Staked the threaded end of the screw from inside the starter frame to manufacturer's specifications.		
7. Cleaned the end of the field connecting strap and the slotted area of the contact post with fine sandpaper.		
8. Inserted the end of the field connector strap through the slot of the contact post with fine sandpaper.		
9. Soldered the connection with rosin-core solder.		
10. Removed the upper ground brush retaining screw and discarded the brush.		
11. Placed the field ground lead terminal and new ground brush terminal block together and installed the original retaining screw.		
12. Installed the armature and drive assembly, drive yoke and drive yoke pivot pin. Added a few drops of oil to both ends of the armature shaft.		
13. Slid the stop ring retainer into place on the armature shaft and positioned the drive yoke return spring in the drive-end housing; then installed the housing to the starter frame.		
14. Installed the end plate and the through bolts, and tightened securely. Inserted the brushes in their holders.		
15. Pressed on the starter drive yoke until the movable pole shoe is bottomed. Checked the clearance between the new contact points and adjust to a .020 - .100 clearance.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 85 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
16. Installed protective tap over the brush openings of the starter frame; then installed the drive yoke cover and gasket and the brush-cover band.		
17. Installed and tightened the brush-cover band retaining screw.		

APPROVED: YES ____ NO ____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 86

TASK

Replace tail lights

STANDARD OF PERFORMANCE OF TASK

The tail lights must function according to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A vehicle with defective tail lights
Tail light replacements
Tools

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, pp. 1-5.

TEACHING ACTIVITIES

1. Read and discuss pp. 1-5, chapter 7 in **Fundamentals of Service - Electrical Systems**.
2. Discuss how to identify correct replacement bulb.
3. Demonstrate proper removal of the tail light fuse.
4. Discuss the importance of not overtightening plastic light covers.
5. Have the students complete the performance checklist attached to this lesson.

PERFORMANCE OBJECTIVE 86

CRITERION-REFERENCED MEASURE

Questions

1. What powers the tail lights?
2. What should you always do when replacing light bulbs?
3. What may cause a tail light to fail?

Answers

1. The battery and generator/alternator.
2. Make sure the replacement bulb is of the same style and part number as the old one.
3. Defective light, broken or disconnected wire, corroded connections, failed switch, or blown fuse.

Practical Application

The student will properly replace the tail lights on a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 86 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 86 EVALUATION

REPLACING TAIL LIGHTS

Student's Name **Date**

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Secured necessary tools.		
2. Located defective tail light and secured correct replacement.		
3. Removed tail light fuse.		
4. Removed defective part of light and replaced with new light.		
5. Replaced any covers or brackets that may have been removed.		
6. Reconnected light fuse.		
7. Checked to see if light works.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 87

TASK

Replace temperature gauge

STANDARD OF PERFORMANCE OF TASK

Cooling system should function without leaks, and temperature gauge should record engine temperature to manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Temperature gauge
Tools

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, pp. 8-9.

TEACHING ACTIVITIES

1. Discuss the parts of the temperature gauge assembly and how they work.
2. Discuss the importance of not bending the sending unit tube.
3. Demonstrate ways to avoid leaks around the sending unit in the block, such as teflon tape.
4. Have the students complete the criterion-referenced questions listed.
5. Have the students complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What is teflon tape used for?
2. Is the cooling system more likely to leak when cold or hot?
3. What is the factor that causes the cooling system to leak?

PERFORMANCE OBJECTIVE 87

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Prevent leaks.
2. Hot
3. Increased pressure.

Practical Application

The students will properly replace a temperature gauge on a tractor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 87 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 87 EVALUATION

REPLACING TEMPERATURE GAUGE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Drained cooling system below level of sending unit in engine block.		
2. Disconnected temperature sending unit in engine block.		
3. Disconnected temperature gauge from dash of tractor.		
4. Installed new gauge into dash. Took care not to bend sending unit tube.		
5. Routed sending unit tube or wire, whichever the case, along engine where it will not interfere with any engine functions.		
6. Installed sending unit into engine block.		
7. Filled cooling system.		
8. Started tractor and checked for leaks. Temperature gauge should have registered after several minutes of running.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 88

TASK

Replace thermostat

STANDARD OF PERFORMANCE OF TASK

The thermostat must activate and deactivate according to temperature settings. There will be no coolant leakage.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with a liquid-cooled engine having a defective thermostat
Necessary tools
Shop rags
Replacement thermostat

ENABLING OBJECTIVES

1. Read and interpret the written directions which are given.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Engine, Chapter 8, pp. 7-8.

TEACHING ACTIVITIES

1. Discuss the function and operation of the thermostat.
2. Discuss the importance of cleaning gasket surfaces on the engine block and thermostat housing.
3. Demonstrate the proper way to position the thermostat.
4. Discuss the importance of positioning the thermostat with the expansion element towards the engine.
5. Have the students complete the criterion-referenced questions listed.

CRITERION-REFERENCED MEASURE

Questions

1. Name the two types of thermostats used today.
2. Name two things which may damage the thermostat in the engine.
3. The thermostat should be installed in what position?

PERFORMANCE OBJECTIVE88

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Bellows - types, bimetallic - type.
2. Overheating and rust.
3. With the expansion element towards the engine.

Practical Application

The student will properly replace the thermostat in a vehicle.

Method of Evaluating Practical Application

Use Checklist Performance Objective 88 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 88 EVALUATION

REPLACING THERMOSTAT

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Obtained necessary tools, shop rags, container to collect drained coolant, replacement thermostat, and operator's manual.		
2. Removed any objects that prevent access to the thermostat housing.		
3. Drained coolant to a level below the thermostat (NOTE: Coolant may be drained through the radiator petcock).		
4. Removed thermostat housing and thermostat.		
5. Cleaned gasket surfaces on both the engine block and thermostat housing.		
6. Installed new gasket and thermostat and secured themostat housing.		
7. Installed any components removed to gain access to the thermostat housing.		
8. Filled the cooling system to the required level with the proper coolant.		
9. Pressure tested the system for leaks.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 88 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
10. Ran engine to normal operating temperature and rechecked coolant level.		

APPROVED: YES _____ NO ____

Evaluator's Signature Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 89

TASK

Replace voltage regulator

STANDARD OF PERFORMANCE OF TASK

Voltage regulator must be securely mounted and electrical leads securely fastened to appropriate terminal (field, armature, starter).

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A piece of farm machinery with a defective voltage regulator
A replacement voltage regulator
Necessary tools
Shop rags
Operator's manual

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 4, pp. 18-30.

TEACHING ACTIVITIES

1. Discuss the function of the voltage regulator.
2. Discuss the importance of polarizing the generator.
3. Demonstrate how to polarize a generator.
4. Have the students complete the criterion-referenced questions listed.
5. Have the students complete the performance guide attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What is the function of the voltage regulator?
2. The "voltage" is really a combination of what 3 functions?
3. What must be done after connecting the battery ground cable?

PERFORMANCE OBJECTIVE 89

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. To control current output and discharge.
2. Cut out relay, voltage regulator, current regulator.
3. The generator must be polarized.

Practical Application

The student will properly replace a voltage regulator.

Method of Evaluating Practical Application

Use Checklist Performance Objective 89 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 89 EVALUATION

REPLACING A VOLTAGE REGULATOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained necessary tools, shop rags, replacement voltage regulator, and operator's manual.		
2. Disconnected the ground cable at the battery.		
3. Disconnected the wiring harness from the voltage regulator.		
4. Removed mounting screws and removed the voltage regulator.		
5. Checked correct placement of regulator hose gasket before installation.		
6. Installed new regulator and tightened mounting screws. (NOTE: Do not over-tighten mounting screws as this may cause damage to mounting base bushing or mounting screws.)		
7. Connected voltage regulator wiring harness.		
8. Connected ground cable at the battery. (NOTE: Be sure to read operator's manual carefully concerning polarization generator).		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 90

TASK

Replace warning signal or implement lights

STANDARD OF PERFORMANCE OF TASK

All lights in the system must be fully operational in accordance with manufacturer's specifications.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An implement with defective light(s) and replacement bulb

ENABLING OBJECTIVES

1. Read and interpret all written instructions given here.
2. Identify all relative safety procedures.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 7, pp. 1-5.

TEACHING ACTIVITIES

1. Read and discuss pages 1-5, chapter 7, in **Fundamentals of Service - Electrical Systems**.
2. Discuss why the fuse is disconnected before replacing the bulb.
3. Demonstrate proper removal of the fuse.
4. Discuss how to select the proper replacement bulb.
5. Have the students complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What powers warning signal, or implement lights?
2. Why is the fuse disconnected before replacing the bulb?
3. What should you always do when replacing light bulbs?

Answers

1. The battery and generator/alternator.
2. To prevent an accidental short.
3. Make sure the replacement bulb is of the same style and part number as the old one.

PERFORMANCE OBJECTIVE 90

CRITERION-REFERENCED MEASURE (Continued)

Practical Application

The student will properly replace warning signal, or implement lights on an implement.

Method of Evaluating Practical Application

Use Checklist Performance Objective 90 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 90 EVALUATION

REPLACING WARNING SIGNAL OR IMPLEMENT LIGHTS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Secured necessary tools.		
2. Diagnosed defective light and had replacement available.		
3. Disconnected fuse to prevent accidental "short."		
4. Removed warning signal, or implement light from housing or from vehicle and disconnected wire or wires.		
5. Replaced with new light and reconnected all connections.		
6. Replaced fuse.		
7. Checked light to see if light functions.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 91

TASK

Sharpen convention baler shearer plate knife

STANDARD OF PERFORMANCE OF TASK

The knife must be sharpened to a 45 degree angle, and finished edge must be without nicks.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A baler shearer plate knife
Proper tools
Grinder

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Farm Power And Machinery Management, pp. 164-165.

TEACHING ACTIVITIES

1. The instructor will discuss the function of the shearer plate knife.
2. Demonstrate proper use of the grinder.
3. Discuss how to check the knife angle with a template.
4. Have the students complete the criterion-referenced questions listed.
5. Have the students complete the performance checklist attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What should always be worn when using the grinder?
2. What is used to check the blade for proper angle?
3. What is the function of the shearer plate knife?

Answers

1. Gloves and safety glasses
2. A template
4. To cut the hay to a uniform width.

CRITGERION-REFERENCED MEASURE (Continued)

Practical Application

The student will properly sharpen a conventional baler shearer plate knife.

Method of Evaluating Practical Application

Use Checklist Performance Objective 91 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 91 EVALUATION

SHARPENING CONVENTIONAL BALER SHEARER PLATE KNIFE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Read operator's manual for removal and sharpening of knife.		
2. Removed the knife.		
3. Sharpened the knife, removing all nicks.		
4. Sharpened the knife to a 45° angle, and checked with the template.		
5. Reinstalled the knife.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 92

TASK

Sharpen ensilage cutter knives

STANDARD OF PERFORMANCE OF TASK

The cutter knives must have an angle of between 30-45 degrees as specified by manufacturer and give a clean cut when in use. The knives will be sharpened using any of three methods:

1. Grinder with knives removed.
2. Cutting-edge touch up stone.
3. Integral electric or hydraulic grinder.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

An ensilage cutter
Necessary tools

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCES

1. **Farm Power and Machinery Management**, pp. 158-160.
2. **Selecting and Maintaining Field Mowers**, pp. 24-31.

TEACHING ACTIVITIES

1. Discuss the operation of the silage cutter-bar assembly.
2. Discuss the need for sharp cutter knives.
3. Demonstrate how to check knives for proper positioning.
4. Demonstrate how to set knife clearance.
5. Have the students complete the performance guide attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. Which side(s) of the knives should be sharpened?
2. What is the best way to check blades for sharpness?
3. What may be used to check blade angles?

PERFORMANCE OBJECTIVE 92

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Top side only
2. Check blades by hand carefully.
3. A template.

Practical Application

The student will properly sharpen ensilage cutter knives.

Method of Evaluating Practical Applications

Use Checklist Performance Objective 92 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 92 EVALUATION

SHARPENING ENSILAGE CUTTER KNIVES

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained necessary tools and appropriate operator's manual.(NOTE: Most late models are equipped with knife sharpeners).		
2. Checked knives for proper position prior to sharpening.		
3. Sharpened only the top side of the knives.		
4. Sharpened the knives to an angle between 30-45 degrees as specified by manufacturer.		
5. Reinstalled and/or set clearance of knives.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 93

TASK

Sharpen rotary mower blades (bush hog)

STANDARD OF PERFORMANCE OF TASK

The blades must be sharpened to a 45° angle, have sharp finished edge, and be balanced.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A coarse stone or power grinder and mower blades

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Selecting and Maintaining Field Mowers, pp. 56-62.

TEACHING ACTIVITIES

1. Demonstrate the proper use of the grinder.
2. Discuss the need for cooling the blades frequently.
3. Demonstrate how to check the blades for balance.
4. Have the students complete the criterion-referenced questions.
5. Have the student complete the performance guide attached to this lesson.

CRITERION-REFERENCED MEASURE

Questions

1. What should always be worn when using the power grinder?
2. Why must the blades be balanced?
3. Why should the blade be cooled often while sharpening?

Answers

1. Gloves and safety glasses.
2. To prevent excess shaking of the mower.
3. To prevent the blade from "burning" or loosing its temper.

PERFORMANCE OBJECTIVE 93

CRITERION-REFERENCED MEASURE (Continued)

Practical Application

The student will properly sharpen a rotary mower blade.

Method of Evaluating Practical Application

Use Checklist Performance Objective 93 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 93 EVALUATION

SHARPENING ROTARY MOWER BLADES

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Consulted operator's manual for removing and sharpening mower blades.		
2. Assembled needed tools and hand power grinder.		
3. Removed blades from mower.		
4. Sharpened at 45° angle to remove most of nicks; sharpen only top side of blade. (NOTE: Avoid "burning" blade while sharpening by cooling frequently in water).		
5. Removed equal amount of metal from each blade and checked balance.		
6. Reinstalled blades on rotary mower.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 94

TASK

Sharpen sickle bar

STANDARD OF PERFORMANCE OF TASK

The sickle bar must be sharpened to remove all nicks and give a clean cut.

SOURCE OF STANDARD

Virginia Writing Team.

CONDITIONS FOR PERFORMANCE OF TASK

A sickle-bar type tractor mower
Proper tools
Grinder

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Selecting and Maintaining Field Mowers, pp. 21-34.

TEACHING ACTIVITIES

1. Have students read and discuss pp. 21-34 in **Selecting and Maintaining Field Mowers**.
2. Identify the parts which must be adjusted.
3. Discuss when to replace worn knives.
4. Demonstrate the proper way to grind mower sections.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. Why can mower knives cut your fingers even when the mower isn't running.
2. Should you check the sickle bar for straightness whenever you remove it?
3. How are the knives attached to the sickle bar?

PERFORMANCE OBJECTIVE 94

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. Because the knives are sharp and move even when the machine is slightly bumped.
2. Yes - To prevent binding, rough running and excessive wear.
3. Rivets

Practical Application

The student will properly sharpen a sickle bar mower.

Method of Evaluating Practical Application

Use Checklist Performance Objective 94 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 94 EVALUATION

SHARPENING A SICKLE BAR

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Disconnected pitman and slide sickle bar out of mower.		
2. Set up grinder with sickle-bar stone. Ground mower sections until all are of proper angle and sharp. (NOTE: If too much material has to be removed in order to get section sharp, section must be replaced).		
3. Reinstalled bar into mower making sure all guards are in proper relationship with sickle bar		
4. Connected pitman.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 95

TASK

Start engine using jumper cables

STANDARD OF PERFORMANCE OF TASK

Battery cables must connect the two batteries with positive to positive, and the charged battery must be the same voltage as the charged auxiliary battery. Cables must be connected properly, and the engine should start.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a dead battery
Battery cables
A charged auxiliary battery

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety practices.

RESOURCE

Fundamentals of Service - Electrical Systems, Chapter 3, pp. 1-20.

TEACHING ACTIVITIES

1. Discuss all safety precautions which should be taken when jumping batteries.
2. Discuss how to identify a battery's voltage.
3. Demonstrate how to identify the positive and negative terminals on the battery.
4. The student will complete the criterion-referenced questions attached to this lesson.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. Jump starting with batteries of differing ____________ can damage a battery.
2. What can touching the two ends of the jumper cables cause?
3. What color cable is attached to the positive battery terminal on a positively grounded engine?

PERFORMANCE OBJECTIVE 95

CRITERION-REFERENCED (Continued)

Answers

1. Voltages
2. Short
3. Red

Practical Application

The student will properly start an engine using jumper cables.

Method of Evaluating Practical Application

Use Checklist Performance Objective 95 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 95 EVALUATION

STARTING AN ENGINE USING JUMPER CABLES

Student's Name	Date

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Precautions: a. Did not jump frozen batteries. b. Made sure batteries were of the same voltage. c. Removed vent caps and cover with heavy cloth, if battery had vent caps.		
2. Connected red cable to positive terminal of auxiliary battery.		
3. Connected black cable to negative terminal of auxiliary battery.		
4. Took care that opposite two ends of jumper cables did not touch.		
5. Connected opposite end of black cable (negative) to tractor's frame.		
6. Connected opposite end of red cable to positive terminal of tractor battery. Was extremely careful to get red cable on both positive terminals and black cable on the negative terminal of charged battery. The opposite end of the black cable (negative) is to be grounded to the dead battery's engine frame. (Caution: Older vehicles may have positive ground).		

CHECKLIST FOR PERFORMANCE OBJECTIVE 95 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
7. Started engine and removed cables in reverse order.		

APPROVED: YES _____ NO _____

Evaluator's Signature   Date

DUTY PERFORMING NONSCHEDULED FARM MACHINERY MAINTENANCE

PERFORMANCE OBJECTIVE 96

TASK

Steam/high pressure clean machinery

STANDARD OF PERFORMANCE OF TASK

The machine should be completely free of dirt, oil or grease. The engine must be operational after steam cleaning.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A dirty machine with an engine
A steam cleaner ready for use

ENABLING OBJECTIVES

1. Identify all relative safety procedures.
2. Read and interpret the operator's manual.

RESOURCE

Agricultural Mechanics: Fundamentals and Applications, pp. 315-317.

TEACHING ACTIVITIES

1. Have students read and discuss pp. 315-317 in **Agricultural Mechanics: Fundamentals and Applications**.
2. Discuss safety practices concerned with operating the steam cleaner.
3. Discuss the importance of covering the distributor, coil, carburetor throat, and glass fuel bowl.
4. Demonstrate the proper operation of the steam cleaner.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. What can cause the steam cleaner to strip the paint off of a machine being cleaned?
2. Why are electrical parts such as the distributor covered before steam cleaning?
3. When shutting down the steam cleaner, which is shut off first, the burner or the water?

PERFORMANCE OBJECTIVE 96

CRITERINION-REFERENCED MEASURE (Continued)

Answers

1. Excess pressure, steam discharge nozzle too close, spending too much time in one place.
2. To prevent water from getting into them.
3. Burner.

Practical Application

The student will properly steam/high pressure clean a dirty machine.

Method of Evaluating Practical Application

Use Checklist Performance Objective 96 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 96 EVALUATION

STEAM/HIGH PRESSURE CLEANING MACHINERY

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Secured protective clothing and protective goggles.		
2. Removed parts that prevent access to the areas that are to be cleaned.		
3. Covered any areas that should remain dry, such as: a. Glass fuel bowl b. Distributor c. Coil d. Carburetor throat.		
4. Started cleaner pump, and adjusted selector valve for steam clean or high pressure. a. Turned on burner when water comes from nozzle. b. Held nozzle 8-10 inches from machine. c. Avoided direct steaming at any glass parts.		
5. Finished with clean water.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 96 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
6. Cut off burner.		
7. Allowed pump to run until water coming from nozzle was cool.		
8. Cut off pump.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

PERFORMING FIELD OPERATIONS

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 97

TASK

Attach farm equipment to drawbar

STANDARD OF PERFORMANCE OF TASK

The equipment must be attached securely to the drawbar in accordance with instructions given. The tractor and equipment must be attached in accordance with OSHA's safety standards.

SOURCE OF STANDARD

VIrginia Writing Team
Deere. **Fundamentals of Machine Operation : Agricultural Machinery Safety,** pp. 164-167.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
A piece of equipment
Instructions for attaching the equipment to the drawbar

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Farm Power and Tractor, pp. 396-400.

TEACHING ACTIVITIES

1. Discuss and demonstrate adjusting drawbar length, height, and lateral position.
2. Discuss safety procedures used when hooking-up farm equipment.
3. Demonstrate backing the tractor into position and hooking-up equipment.
4. Discuss the reason for and importance of locking the tractor brakes.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. On PTO powered equipment, improper drawbar length can damage the _______________.
2. On most tractors how can drawbar height be changed?
3. Why are the tractor brakes locked once the tractor is properly positioned?

PERFORMANCE OBJECTIVE 97

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. PTO Shaft
2. By rotating the drawbar 180 degrees.
3. To prevent the tractor from rolling out of position.

Practical Application

The student will attach a piece of farm equipment to a tractor drawbar.

Method of Evaluating Practical Application

Use Checklist Performance Objective 97 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 97 EVALUATION

ATTACHING FARM EQUIPMENT TO DRAWBAR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor, equipment, and instructions.		
2. Read instructions.		
3. Adjusted drawbar height.		
4. Checked drawbar length setting.		
5. Checked lateral (sideways) position of drawbar.		
6. Backed tractor into position so the hole in drawbar was in line with hole in hitch of equipment.		
7. Set and locked tractor brakes.		
8. Attached equipment to drawbar.		
9. Made electrical and hydraulic connections if needed.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 98

TASK

Bale hay using "big" round baler

STANDARD OF PERFORMANCE OF TASK

Hay must be baled to produce an even core with hay being evenly distributed across the full width of the baler and tied securely. There must be five 6-feet diameter bales of hay.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Field Operation**, pp. 148-157.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a "big" round baler attached

ENABLING OBJECTIVES

1. Read and interpret the operator's manual.
2. Identify all relative safety procedures.

RESOURCE

Farm Power and Machinery Management - Lab Manual and Workbook, pp. 165-167.

TEACHING ACTIVITIES

1. Discuss the purpose of the baler.
2. Discuss how the baler works.
3. Demonstrate the operation of the baler.
4. Demonstrate and discuss baler adjustments.
5. The student will complete the performance evaluation.

CRITERION-REFERENCED MEASURE

Questions

1. (True or False) Big round bales can weight more than 1000 pounds.
2. You should try not to drive on the ____________ when baling.
3. Most balers require __________ rpm PTO speeds?

PERFORMANCE OBJECTIVE 98

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. True
2. Windrow
3. 540 rpm.

Practical Application

The student will properly bale hay using a "big" round baler.

Method of Evaluating Practical Application

Use Checklist Performance Objective 98 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 98 EVALUATION

BALING HAY USING A "BIG" ROUND BALER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and baler.		
2. Checked for proper threading of baling twine.		
3. Checked baler to see that all parts operate freely.		
4. Field adjusted baler if needed.		
5. Baled hay. a. The windrow width should be slightly over one-half of the baler length, or just under the total bale length. b. Made sure the tractor PTO speed matches the speed required by the baler (usually 540 RPM). c. Avoided driving on windrow. Adjusted wheels as necessary.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 99

TASK

Bale hay using conventional "square" baler

STANDARD OF PERFORMANCE OF TASK

Hay must be chopped and compacted into a bale that is tied with a length within the limits set by the instructor. There must be 25 bales of hay.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, pp. 230-231.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with baler attached
Instructions for baling hay

ENABLING OBJECTIVES

1. Use a tractor safely.
2. Follow specific instructions on the use of a baler.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, pp. 385-390.

TEACHING ACTIVITIES

1. Demonstrate proper method of servicing a square baler using the operator's manual.
2. Discuss the parts of a baler and their functions.
3. The student will insure baler is functioning properly.
4. Discuss the tying process in detail (including trouble-shooting).
5. Practice baling a bale of hay for student observation.
6. Have student complete performance checklist.

CRITERION-REFERENCED MEASURE

Questions

1. Balers should never operate over ____________ PTO r/min.
2. The __________ packs the hay into the bale chamber.
   a. Hay dogs
   b. Feed Auger
   c. Plunger
   d. PTO

PERFORMANCE OBJECTIVE 99

CRITERION-REFERENCED MEASURE (Continued)

3. The ____________ ________________ performs the last mechanical job in tying a knot.
    - a. Twine disk
    - b. Needle
    - c. Billhook
    - d. Wiper arm

Answers

1. 1000
2. c
3. d

Practical Application

The student will bale 25 bales of hay using a conventional "square" baler.

Method of Evaluating Practical Application

Use Checklist Performance Objective 99 to determine if the assignment was completed with 100 percent

CHECKLIST FOR PERFORMANCE OBJECTIVE 99 EVALUATION

BALING HAY USING CONVENTIONAL "SQUARE" BALER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor with baler attached.		
2. Adjusted baler for proper bale weight.		
3. Checked baler for proper operation.		
4. Checked baler for proper operation.		
5. Baled hay. a. Baled in the same direction that the windrower or rake traveled, for cleaner pickup. b. Drove in a lower gear for a short time to be sure the baler was functioning. c. Made sure the tractor's PTO speed matches the speed required by the baler (usually 540 RPM). d. Avoided driving on windrows. Adjusted wheels as necessary.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 100

TASK

Clear brush and weeds with rotary mower (bush hog)

STANDARD OF PERFORMANCE OF TASK

Clipping a 1/4 acre plot of ground of weeds and brush, weeds and brush must be clipped smooth and at a height of 3 to 5 inches and within limits of the machine being used considering factors such as:

1. Sharpness of blade
2. Condition of blade
3. Terrain

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, pp. 300-302.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with rotary mower attached
A situation to mow brush and weeds

ENABLING OBJECTIVES

1. Measure a 1/4 acre.
2. Be familiar with safe tractor operation.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, p. 380.

TEACHING ACTIVITIES

1. Demonstrate proper method to service rotary mower using the operator's manual.
2. The student will demonstrate the ability to properly use the hydraulic system of the tractor.
3. Identify and describe the rate of cut and method of travel.
4. Identify and define materials that cannot be cut.
5. Demonstrate the steps in the performance guide.

PERFORMANCE OBJECTIVE 100

CRITERION-REFERENCED MEASURE (Continued)

Questions

1. Rotary mowers are generally not used to cut:
    a. Weeds
    b. Hay
    c. Pastures
    d. Orchards.
2. The range of speed for cutting is ______________ mph.
3. ______________ should be adjusted to the proper tension.

Answers

1. b
2. 5-10
3. Belts

Practical Application

The student will clear brush and weeds with a rotary mower.

Method of Evaluating Practical Application

Use Checklist Performance Objective 100 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 100 EVALUATION

CLEARING BRUSH AND WEEDS WITH ROTARY MOWER (BUSH HOG)

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired needed equipment.		
2. Checked belts for proper tension.		
3. Checked rotary blades for tightness prior to starting tractor engine.		
4. Checked drawbar and/or lift setting for leveling the rotary mower.		
5. Checked equipment for proper safety shields.		
6. Clipped weeds and brush to a height of 3 to 5 inches. a. Maintained PTO speed required by the rotary mower. b. Avoided rocks and other obstructions.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 101

TASK

Connect remote hydraulic cylinders

STANDARD OF PERFORMANCE OF TASK

The hose couplings must be locked into the ports. The hydraulic cylinder must provide quick and smooth movement through raising and lowering the attached implement.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a piece of equipment attached
Operator's manual
Necessary tools
Cleaning cloth

ENABLING OBJECTIVES

1. Familiar with fluid power theories.
2. Follow checklist in operator's manual.

RESOURCE

Synflex, pp. 16-31.

TEACHING ACTIVITIES

1. Describe step by step instructions of operator's manual.
2. Discuss the fluid power capabilities of the tractor.
3. Show the proper method of connecting hydraulic couplings.
4. Have students complete performance checklist.
5. Have students practice connecting a hydraulic wood splitter.
6. Appraise each student's methods and provide instant feedback.

CRITERION-REFERENCED MEASURE

Questions

1. Cleanliness of a hydraulic system is of ____________ importance.
    a. great
    b. less.
2. After connecting coupling always check for ______________.
3. Always cover coupling ports with _________ _________.

PERFORMANCE OBJECTIVE 101

CRITERION-REFERENCED MEASURE (Continued)

Answers

1. a
2. Leaks
3. Dust plugs

Practical Application

After receiving the necessary instructions, the student will successfully connect remote hydraulic cylinders following teacher guidelines.

Method of Evaluating Practical Application

Use Checklist Performance Objective 101 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 101 EVALUATION

CONNECTING REMOTE HYDRAULIC CYLINDERS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired tractor with attached implement.		
2. Read operator's manual.		
3. Removed dust plugs.		
4. Checked ports and hose couplers for cleanliness.		
5. Removed pressure in tractor hydraulic lines.		
6. Locked couplings into ports.		
7. Checked for proper operation.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 102

TASK

Cultivate crops with the rotary hoe

STANDARD OF PERFORMANCE OF TASK

The crop must be free of weeds, and soil crust broken to accomodate the hoe being used in respect to the condition, type, and moisture content of the soil. The crop cultivated must show no signs of root damage.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Field Operations**, pp. 207-209.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with rotary hoe attached and 1/4 acre of land planted in row crops

ENABLING OBJECTIVES

1. Familiar with tractor operation and safety.
2. Identify the need for cultivating crops.

RESOURCE

Jacobs, et al. **Agricultural Power and Machinery**, p. 317.

TEACHING ACTIVITIES

1. Illustrate proper methods of cultivating.
2. Have students discuss and map out proper directions of travel.
3. Demonstrate ability to service and prepare cultivator for safe operation.
4. Demonstrate the steps in the performance guide.
5. Measure student progress through criterion-referenced questions.

CRITERION REFERENCED MEASURE

Questions

1. The rotary hoe is used when crops are:
    a. 1" - 2"
    b. 2" - 4"
    c. over 5"
    d. Not yet emerged.
2. The teeth of the hoe enter the soil:
    a. Horizontally
    b. Vertically

PERFORMANCE OBJECTIVE 102

CRITERION-REFERENCED MEASURE (Continued)

3. What are the basic functions of the rotary hoe?
    a. Weed control
    b. Deep plowing
    c. Top soil aeration
    d. Planting

Answers

1. b
2. b
3. a and c

Practical Application

The student will successfully cultivate a crop using the rotary hoe.

Method of Evaluating Practical Application

Use Checklist Performance Objective 102 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 102 EVALUATION

CULTIVATING CROPS WITH A ROTARY HOE

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and rotary hoe.		
2. Adjusted rotary hoe for: a. Level operation b. Tightness of feet c. Line-up of feet.		
3. Adjusted lift to cultivating depth (3 inches).		
4. Cultivated the crop with rotary hoe. (NOTE: Normally three or four cultivations are sufficient for practical weed control). a. Operated tractor and rotary hoe to avoid damage to plants. b. The rotary hoe may be used effectively at speeds of 10 to 12 MPH.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 103

TASK

Cultivate crops with row crop cultivator

STANDARD OF PERFORMANCE OF TASK

Cultivate one-fourth acre of row crop. Cultivation must eliminate weeds. Attending instructor must agree that cultivation is done within capabilities of particular cultivator being used.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Field Operations,** pp. 210 - 211.

CONDITIONS FOR PERFORMANCE OF TASK

A specified row crop
A tractor with row cultivator attached
A situation for cultivating the specified row crop

ENABLING OBJECTIVES

1. Be familiar with safe tractor operation.
2. Identify row crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery,** pp. 315- 316.

TEACHING ACTIVITIES

1. Analyze the purpose and need for row crop cultivation.
2. Demonstrate proper adjustment of cultivator to a specific crop.
3. Demonstrate steps in performance guide.
4. Have student complete the performance checklist attached to the lesson.
5. Examine and record student progress.

PERFORMANCE OBJECTIVE 103

CRITERION-REFERENCED MEASURE

Questions

1. Choose the proper cultivator by analyzing:
    a. Crop height
    b. Soil moisture
    c. Type of crop
    d. Row width.
2. The __________ of the cultivator makes contact with the soil.
3. Cultivators are normally __________ or rear mounted on a tractor.

Answers

1. c
2. Feet
3. Front

Practical Application

The student will successfully cultivate a crop using a row crop cultivator leaving less than 5% of the weeds in the plot.

Method of Evaluating Practical Application

Use Checklist Performance Objective 103 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 103 EVALUATION

CULTIVATING CROPS WITH A ROW CROP CULTIVATOR

Student's Name Date

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and cultivator.		
2. Drove tractor to designated area.		
3. Adjusted cultivator to field operations. a. Adjusted depth to cultivate. b. Adjusted width between the feet.		
4. Checked feet for sharpness and tightness.		
5. Cultivated the specified crop. a. Kept tractor's wheels and cultivator's feet in the middle between crop rows. b. Provided special protection for the crop if required for first cultivation (metal fenders or shields).		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 104

TASK

Cut hay with a mower-conditioner

STANDARD OF PERFORMANCE OF TASK

Cutting and conditioning one-fourth acre of hay, the hay must be cut clean, and each cut must be equal to the width of the hay conditioner.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: File Operations, p. 52.**

CONDITIONS FOR PERFORMANCE OF TASK

A situation of cutting hay using a mower-conditioner
A tractor

ENABLING OBJECTIVES

1. Familiar with safe tractor operation.
2. Familiar with types of hay crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 380-383.

TEACHING ACTIVITIES

1. List and describe methods for using a hay conditioner.
2. Discuss how to adjust rollers for specific hay crops.
3. Demonstrate steps in performance guide.
4. Have the students compare differences in conditioned versus non-conditioned hay.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 104

CRITERION-REFERENCED MEASURE

Questions

1. Conditioners are used on ____________ crops because the leaves tend to shed easily.
2. Flail type conditioners condition the hay with ____________ rather than rollers.
3. Conditioning causes the crop to cure: a) Faster b) Slower.

Answers

1. Legume
2. Knives or flails
3. a

Practical Application

The student will cut hay with mower conditioner insuring proper crushing and crimping.

Method of Evaluating Practical Application

Use Checklist Performance Objective 104 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 104 EVALUATION

CUTTING HAY WITH A MOWER - CONDITIONER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired tractor, equipment, and instructions.		
2. Checked tractor and equipment for proper operation.		
3. Mowed and conditioned the hay. a. Checked power take off. b. Checked rollers for proper clearance, crushing, and crimping. c. Adjusted cutting height for hay.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

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DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 105

TASK

Cut hay with a (swather) bar mower

STANDARD OF PERFORMANCE OF TASK

The knife register must be adjusted until the knife sections are exactly centered behind the guards at the end of the stroke. Hay must be cut with a stroke that equals the guard spacing. Hay must be clean cut, and the width of each cut must equal the width of the mower.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a bar mower attached
A situation of cutting hay

ENABLING OBJECTIVES

1. Be familiar with safe tractor operation.
2. Be able to determine acreage.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 377-380.

TEACHING ACTIVITIES

1. Discuss and demonstrate ability to adjust and service the bar mower for safe operation.
2. Illustrate the cutting action of the bar mower.
3. Have students read and discuss the textbook, **Agricultural Power and Machinery.**
4. Demonstrate abilities contained in the performance guide.
5. Have students complete performance checklist attached to lesson.

PERFORMANCE OBJECTIVE 105

CRITERION-REFERENCED MEASURE

Questions

1. The ____________ should be adjusted so that the cutter bar runs level with the ground.
2. The __________ controls the cutting height.
   a. Knife
   b. Guard
   c. Shoe
   d. Wear plate

3. During operation the cutter bar should be:
   a. Parallel
   b. At right angle
   c. Behind the tractor.

Answers

1. Tilt
2. c
3. b

Practical Application

After reviewing necessary instruction the student will cut hay with a bar mower making sure proper height and width of cut is established.

Method of Evaluating Practical Application

Use Checklist Performance Objective 105 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 105 EVALUATION

CUTTING HAY WITH A (SWATHER) BAR MOWER

Student's Name   Date

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and mower.		
2. Adjusted mower to correct register. (NOTE: Cutting height depends upon crop and ground conditions).		
3. Checked mower for proper operation. a. Examined and replaced damaged guards. b. Tightened all bolts and nuts.		
4. Checked blades making sure they are sharp and spaced correctly.		
5. Cut hay. a. Made sure the tractor's PTO speed matches the speed required by the mower. b. First cut the hay next to the fence or border by mowing around the field counterclockwise. c. After cutting the first round, mowed the remainder of the field by traveling around the field in a clockwise direction. d. Each cut must be the width of the cutterbar.		

APPROVED: YES _____ NO _____

Evaluator's Signature   Date

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 106

TASK

Drive farm equipment on roads and highways

STANDARD OF PERFORMANCE OF TASK

The tractor and farm machinery must be approved for road use and attached in a safe manner. All necessary warning devices (such as lights, horns, SLOW MOVING VEHICLE emblem, etc.) must be present and operational. The vehicle operator must be licensed to operate vehicle and must conform to all state motor vehicle codes. The equipment must be driven in compliance with all Division of Motor Vehicle Laws.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety,** pp 167-170.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with an attached piece of farm equipment

ENABLING OBJECTIVES

1. Read and interpret Motor Vehicle Laws.
2. Able to obtain valid Driver's License.

RESOURCE

Farm Equipment Service, (Pamphlet) p. 74.

TEACHING ACTIVITIES

1. Review complete procedures before operations check of tractor.
2. Discuss safety and (safe guards) cases unique to certain farm implements.
3. Illustrate examples of misuses in driver courtesies.
4. Secure a resource person from the Dept. of Highways to explain state regulations.
5. Have student complete performance checklist.

PERFORMANCE OBJECTIVE 106

CRITERION-REFERENCED MEASURE

Questions

1. A slow moving vehicle (SMV) emblem is shaped like a:
    a. Square
    b. Rectangle
    c. Circle
    d. Triangle.
2. Tractors should be fitted with __________ equipment for highway use.
3. The SMV emblem is endorsed by the __________ __________ __________ and the American Society of Agricultural Engineers.

Answers

1. d
2. Roll over
3. National Safety Council (NSC)

Practical Application

The student will successfully drive farm equipment on roads and highways observing all safety precautions.

Method of Evaluating Practical Application

Use Checklist Performance Objective 106 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 106 EVALUATION

DRIVING FARM EQUIPMENT ON ROADS AND HIGHWAYS

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Obtained the necessary equipment.		
2. The following was checked for operational safety: a. Lights b. Horn c. Turn signal d. SLOW MOVING VEHICLE emblem e. Brakes.		
3. Was familiar with both state motor vehicle laws and manufacturer's safety guides for the vehicle to be operated.		
4. Started the farm machinery and entered the highway. (NOTE: Brakes should be tested prior to entering the highway).		
5. Drove the farm equipment on the road. Put the machine in as narrow a configuration as possible. (Some states required a special permit to transport equipment more than 8 feet wide).		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 107

TASK

Fertilize soil for planting using fertilizer spreader

STANDARD OF PERFORMANCE OF TASK

Fertilizing one-fourth acre tract of land, the fertilizer must be evenly distributed, and proportion used must be within limits for the crop to be planted as determined by a soil test.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a fertilizer spreader attached
A situation for fertilizing

ENABLING OBJECTIVES

1. Familiar with safe tractor operation.
2. Familiar with characterizing soil fertility.

RESOURCES

1. Jacobs, et al., **Agricultural Power and Machines**, pp. 371-372.
2. **Inspection and Analysis of Commercial Fertilizer in South Carolina**, pp 1-5, & p. 30.

TEACHING ACTIVITIES

1. Discuss proper method for calculating amount of fertilizer needed.
2. Have students select proper fertilizer mixes for the particular application.
3. Demonstrate ability to service and calibrate fertilizer spreader.
4. Diagram direction of travel for proper coverage.
5. Have student complete performance checklist.
6. Examine plot for coverage.

PERFORMANCE OBJECITVE 107 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. Soil test should be done:
    a. Annually
    b. Quarterly
    c. When needed
    d. Semi-annually.
2. Spreading granular fertilizer is normally accomplished using a grain drill attachment or ____________ applicators.
3. Which of the following would not effect the rate of delivery?
    a. Temperature
    b. Travel speed
    c. Ground conditions
    d. Type of tractor.

Answers

1. c
2. Band
3. d

Practical Application

The student will fertilize soil using a fertilizer spreader ensuring adequate coverage.

Method of Evaluating Practical Application

Use Checklist Performance Objective 107 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 107 EVALUATION

FERTILIZING SOIL FOR PLANTING USING A FERTILIZER SPREADER

Student's Name **Date**

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor with spreader attached.		
2. Calibrated the fertilizer spreader.		
3. Checked discharge openings for passageway clearance.		
4. Closed discharge openings.		
5. Filled bin or hopper with recommended fertilizer.		
6. Spread the fertilizer evenly on the area.		
7. Cleaned spreader after using.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 108

TASK

Fill silo using silo blower

STANDARD OF PERFORMANCE OF TASK

The silage blower must be positioned in line with the silo and operated at a speed to prevent clogging and excessive spillage.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation:; Agricultural Machinery Safety,** pp.295-296.

CONDITIONS FOR PERFORMANCE OF TASK

A silage blower
Tractor
Silage wagon filled with silage

ENABLING OBJECTIVES

1. Familiar with PTO safety.
2. Familiar with silage crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 399-400.

TEACHING ACTIVITIES

1. Read and discuss safe operation of silage blower.
2. Identify major points to consider when servicing and adjusting blower.
3. Demonstrate the ability to use silage blower safely.
4. Have students complete performance checklist.
5. Compare differences in types of blowers and wagons.

CRITERION-REFERENCED MEASURE

Questions

1. Most silage blowers are __________ powered.
2. Before operating blower you must make certain the wagon outlet and blower are __________.
3. It is important to __________ all conveyers, augers and shafts before filling a silo.

Answers

1. PTO
2. In line
3. Inspect

Practical Application

The student will successfully fill a silo using a silo blower with minimum spillage loss.

Method of Evaluating Practical Application

Use Checklist Performance Objective 108 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 108 EVALUATION

FILLING A SILO WITH A SILO BLOWER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Read operator's manual.		
2. Checked for proper assembly--blower pipe, tractor, blower preparation, and blower placement.		
3. Checked all moving parts for tightness and clearance.		
4. Filled the silo,. (NOTE: Before filling the vertical silo, raise the unloader to the top of the silo). a. Positioned blower to wagon's outlet. b. Unloaded the silage by engaging blower and wagon's PTO unloader. c. Fed silage to blower evenly to prevent clogging.		
5. Stopped blower when the wagon was empty or when the silo was filled.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS.

PERFORMANCE OBJECTIVE 109

TASK

Harvest corn with corn picker

STANDARD OF PERFORMANCE OF TASK

Picking one-fourth acre of corn, the corn must be picked avoiding more than 3 percent loss and must be picked when the moisture content is from 18 to 22 percent.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation:; Agricultural Machinery Safety**, pp.262-266.

CONDITIONS FOR PERFORMANCE OF TASK

A corn picker
The necessary equipment
A situation for harvesting corn with a corn picker

ENABLING OBJECTIVES

1. Familiar with basic combine functions.
2. Familiar with types of corn.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 412-413.

TEACHING ACTIVITIES

1. Discuss methods for determining losses of ears and kernels.
2. Identify and describe proper methods for lubricating and adjusting a corn picker.
3. Discuss safety procedures involved in operating picker.
4. Have students complete performance checklist.
5. Schedule a tour of implement dealers to compare different models of corn pickers.

PERFORMANCE OBJECTIVE 109 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. The largest loss in corn picking comes from:
    a. Ear loss
    b. Kernel loss.
2. Separator speed is checked using a _________.
3. The corn is unloaded by:
    a. Dumping
    b. A conveyor
    c. An auger on most corn pickers.

Answers

1. a
2. Tachometer
3. c

Practical Application

The student will harvest corn with a corn picker minimizing kernel and ear losses.

Method of Evaluating Practical Application

Use Checklist Performance Objective 109 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 109 EVALUATION

HARVESTING CORN WITH A CORN PICKER

Student's Name **Date**

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Checked moisture content of corn for proper maturity stage.		
2. Acquired corn picker.		
3. Checked corn picker for proper performance and estimate losses.		
4. Adjusted corn picker (if needed).		
5. Started engine and set throttle at low RPM.		
6. Engaged the PTO and brought the RPM up to 540.		
7. Lowered picker head to operating height and eased the corn picker into the crop.		
8. Allowed machine to clear itself of corn before disengaging the tractor's PTO. (NOTE: This avoids the possibility of plugging the rollers).		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 110

TASK

Harvest crops with a combine

STANDARD OF PERFORMANCE OF TASK

The harvested grain must be free of foreign materials and meet a minimum of grain loss as set by the instructor.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, pp 252-258.

CONDITIONS FOR PERFORMANCE OF TASK

A combine
One-fourth acre of grain

ENABLING OBJECTIVES

1. Drive a tractor.
2. Read and follow an operator's manual.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 402-411.

TEACHING ACTIVITIES

1. Describe in detail the various functions a combine accomplishes.
2. Demonstrate the use of each control of the combine.
3. Discuss the proper methods for servicing and lubricating a combine.
4. Identify methods of calculating grain loss.
5. Have students complete performance checklist.
6. Have students analyze loss and efficiency of grain harvested.

PERFORMANCE OBJECTVE 110 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. __________ is referred to as removing the seed from the seed pod.
2. __________ is the first operation the combine does.
   a. Feeding
   b. Separating
   c. Cutting
   d. Thrashing
3. The chaffer and the sieve are commonly known as the cleaning __________.

Answers

1. Thrashing
2. c
3. Shoe

Practical Application

The student will harvest a given crop with a combine and meet grain losses as set by instructor.

Method of Evaluating Practical Application

Use Checklist Performance Objective 110 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 110 EVALUATION

HARVESTING CROPS WITH A COMBINE

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired the combine and read the appropriate operator's manual.		
2. Checked the combine controls for proper setting and made these necessary adjustments: a. Separator b. Head. c. Threshing d. Cleaning e. Grain tank f. Operator's cab. (NOTE: The setting and adjustment of these controls will vary with the crop).		
3. Checked grain loss.		
4. Checked all balls and joints for grease.		
5. Checked moving parts for tightness and clearance.		
6. Harvested the crop.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 111

TASK

Harvest forage with a forage chopper

STANDARD OF PERFORMANCE OF TASK

The forage must be chopped having a moisture content of 35-45 percent, cured and handled with care, as determined by the instructor.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Forage chopper
One-fourth acre of forage

ENABLING OBJECTIVES

1. Familiar with safe tractor operation.
2. Types of forage crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 369-398.

TEACHING ACTIVITIES

1. Organize a visit to a farm implement dealership to examine and discuss types of forage choppers.
2. Discuss varying moisture contents of forage crops.
3. Identify and describe the proper cutter head for the crop you wish to harvest.
4. Demonstrate how to service the forage chopper.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 111

CRITERION-REFERENCED MEASURE

Questions

1. Row crops such as corn or milo can be harvested with a __________ head.
2. __________ heads chop the corn ears and leave the stack in the field.
3. Cutterheads have a __________ installed to blow forage into a wagon.

Answers

1. Row-crop
2. Snapper
3. Fan

Practical Application

Using a forage chopper the student will successfully harvest a forage crop under the proper cutting conditions.

Method of Evaluating Practical Application

Use Checklist Performance Objective 111 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 111 EVALUATION

HARVESTING FORAGE WITH A FORAGE CHOPPER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Identified the type of forage harvester best suited for harvesting. Read the operator's manual.		
2. Determined the type of drive train and set for proper speed.		
3. Selected proper head for crop to be harvested and adjusted the height.		
4. Checked feed rolls for proper clearance and the clearance to feed the cutter head.		
5. Checked cutter head for sharpness of knives.		
6. Cut small amount of forage and checked moisture content and size of cut.		

APPROVED: YES ____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 112

TASK

Plant row crops with conventional row crop planter

STANDARD OF PERFORMANCE OF TASK

The crop seeds must be viable, planted to the depth specified, evenly spaced, covered uniformly, and adequately fertilized. Rows must be evenly spaced to accommodate.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Field Operations,** p 189.

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Row crop planter
Seed
Fertilizer
One-fourth acre

ENABLING OBJECTIVES

1. Familiar with safe tractor operation.
2. Familiar with sizes of specific seed.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery,** pp. 336-341.

TEACHING ACTIVITIES

1. Discuss the types of seed plates used for specific types of seed.
2. Demonstrate ability to service and adjust planter to soil conditions.
3. Discuss the sequence of operations of the planter.
4. Have students practice filling fertilizer and seed hoppers.
5. Have students complete performance checklist attached to lesson.
6. Measure student progress through observation and criterion-referenced questions.

PERFORMANCE OBJECTIVE 112

CRITERION-REFERENCED MEASURE

Questions

1. Edge drop, flat drop and hill drop are examples of __________ plates.
   a. Bean
   b. Grain
   c. Corn
   d. Wheat
2. The __________ must contact ground before seed is dropped.
3. The most common method for controlling depth is position of the __________

Answers

1. c
2. Firming point
3. Press wheel

Practical Application

The student will successfully plant a 1/4 acre plot using a conventional row crop planter.

Method of Evaluating Practical Application

Use Checklist Performance Objective 112 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 112 EVALUATION

PLANTING ROW CROPS WITH A CONVENTIONAL ROW CROP PLANTER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Acquired tractor, row crop planter, appropriate operator's manual.		
2. Checked seed plate feed and drive sprocket for correct spacing of seed in each row.		
3. Made any necessary adjustments on row width.		
4. Adjusted opener to desired depth of seed penetration into the soil.		
5. Checked all planters for identical depth or penetration.		
6. Checked delivery tube to prevent seed clogging.		
7. Filled seed hopper tanks with seed.		
8. Calibrated fertilizer output prior to filling hopper tanks.		
9. Filled fertilizer hopper tanks with recommended fertilizer.		
10. Set markers to guide tractor operator for correct row spacing.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 112 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
11. Oiled and greased moveable parts with a lubrication recommended in the operator's manual.		
12. Planted the seed.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 113

TASK

Plant row crops with grain drill

STANDARD OF PERFORMANCE OF TASK

Planting up to one-fourth acre of grass, clover, or alfalfa, seed must be planted uniformly considering the following factors:

1. Amount of moisture available in soil.
2. Depth required
3. Variety of row crop
4. Row spacing desired
5. Time of seeding (session)
6. Soil Fertility
7. Locality.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Equipment
A grain drill
Grain
A situation for planting a row crop with a grain drill

ENABLING OBJECTIVES

1. Familiar with safe tractor operation.
2. Familiar with types of grain crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp . 341-354.

TEACHING ACTIVITIES

1. Identify and describe correct disks or plates for different types of seed.
2. Demonstrate ability to service separate component parts of a grain drill.
3. Discuss factors involved in the proper operation of the grain drill. (Soil, seed, fertility, etc...)
4. Demonstrate and discuss the proper method to adjust and operate the grain drill.
5. Have student complete performance checklist attached to lesson.
6. Observe and measure student progress and provide immediate feedback.

PERFORMANCE OBJECTIVE 113

CRITERION-REFERENCED MEASURE

Questions

1. All types of grain drills must have some type of seed __________ device
   a. Fertilizing unit
   b. Drum
   c. Metering
   d. Shut off switch.
2. Drum metering requires:
   a. A disk
   b. An air flow
   c. A fluted belt
   d. A seed guide.
3. When planting the operator must maintain a constant __________ to insure accurate coverage.

Answers

1. c
2. b
3. Speed

Practical Application

The student will plant row crops using a grain drill insuring proper seed spacing and depth.

Method of Evaluating Practical Application

Use Checklist Performance Objective 113 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 113 EVALUATION

PLANTING ROW CROPS WITH A GRAIN DRILL

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	**Unsatisfactory**
1. Placed seed in grain drill.		
2. Adjusted planter for planting. a. Calibrated the grain drill. b. Checked discharge openings for clearance. c. Set discharge tubes for proper clearance. c. Set discharge tubes for proper depth. (NOTE: Depth will be determined by variety of seed, soil condition, and time of year).		
3. Planted seed.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 114

TASK

Plant row crops with the no-till crop planter

STANDARD OF PERFORMANCE OF TASK

Planting up to one-fourth acre of corn, the corn must be planted evenly, thoroughly covered with soil, and planted to a depth of approximately 1-1/2 inches depending upon factors such as soil characteristics, terrain, moisture content, temperature, size of grain, and time of season.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with a no-till crop planter attached
A situation for using the no-till planter

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify corn varieties.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 336-337.

TEACHING ACTIVITIES

1. Describe the purpose and use of no-till planting equipment.
2. Demonstrate ability to adjust and service a no-till planter.
3. Demonstrate the proper method of planting with the no-till planter.
4. Have students answer questions in criterion-referenced measure.
5. Have students complete performance checklist.
6. Rate student ability as outlined in performance objective.

PERFORMANCE OBJECTIVE 114

CRITERION-REFERENCED MEASURE

Questions

1. One advantage of no-till planting is:
   a. Use of various seed
   b. Less mechanical and labor costs
   c. Better coverage.
2. Previous crops should be _________ before no-till planting.
   a. Left
   b. Plowed
   c. Cut
   d. Burned
3. No-till planting is used on _________ types of soil.
   a. Few
   b. Most
   c. All

Answers

1. b
2. c
3. b

Practical Application

The student will plant row crops with a no-till crop planter using techniques described by the teacher.

Method of Evaluating Practical Application

Use Checklist Performance Objective 114 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 114 EVALUATION

PLANTING ROW CROPS WITH THE NO-TILL CROPS PLANTER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor with planter attached.		
2. Checked the following field adjustments: a. Row spacing b. Depth c. Seed spacing d. Clearance.		
3. Checked planter for proper operation. a. Checked colter for proper cutting of sod. b. Checked furrow opening for proper seed depth and spacing in soil. c. Checked press wheel for proper firming of soil over the seed.		
4. Plant corn.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 115

TASK

Rake hay

STANDARD OF PERFORMANCE OF TASK

Raking up to one-fourth acre of hay, the hay must be raked using a side-delivery, finger wheel rake, or a buncher attached to the mower. The hay must be raked when its moisture content is approximately 50 percent.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

Tractor with rake
Instructions for raking hay
Up to 1/4 acre of hay

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify hay crops.

RESOURCE

Operator's Manual, Rolabar Rake, pp. 3-27.

TEACHING ACTIVITIES

1. Identify and describe drying conditions for hay varieties.
2. Discuss the operation and use of the hay rake.
3. Identify optional rake accessories and multiple rake operations.
4. Demonstrate proper method of raking with the hay rake.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 115 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. Worn, bent or damaged tines should be __________.
2. Hay should be __________ before raking.
    a. Cured
    b. West
    c. Dusty.
3. Tine bearings should be lubricated:
    a. After each use
    b. Every 1000 acres
    c. Annual
    d. Never.

Answers

1. Replaced
2. a
3. b

Practical Application

After receiving proper instructions the student will rake hay to teacher standards.

Method of Evaluating Practical Application

Use checklist Performance Objective 115 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 115 EVALUATION

RAKING HAY

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor, equipment, and instructions.		
2. Checked equipment for proper function. a. Tightness of teeth. b. Clearance of teeth. c. Height of teeth.		
3. Checked moisture content of hay.		
4. Raked hay. a. Lowered the rake reel. (NOTE: Rake in same direction as mowed). b. Set speed according to conditions (terrain and amount of hay). c. Developed windrows to the size recommended for the baler to be used.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 116

TASK

Spray farm crops using field sprayer

STANDARD OF PERFORMANCE OF TASK

Spraying up to one-fourth acre of a crop, the crop must have an even flow of spray applied to each row, and the mixture of the spray must meet standards recommended by the manufacturer for the particular spray material applied.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, pp 201-212

CONDITIONS FOR PERFORMANCE OF TASK

A tractor with field sprayer attached
A situation for spraying a row crop

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify types of pesticides.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 358-368.

TEACHING ACTIVITIES

1. Identify and describe type of nozzles and their applications.
2. Interpret pesticide labels for proper use and application.
3. Explain the procedure for calibrating sprayer.
4. Have students practice calibrating a sprayer.
5. Demonstrate the proper method of spraying an area.
6. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 116

CRITERION-REFERENCED MEASURE

Questions

1. Stainless steel nozzles have a(n) _________ resistance to wear.
    a. Very poor
    b. Poor
    c. Fair
    d. Excellent
2. Wettable powders require _________ in the tank for proper coverage.
3. Proper tractor _________ is essential for proper coverage.

Answers

1. d
2. Agitation
3. Speed

Practical Application

The student will apply a pesticide using the field type sprayer.

Method of Evaluating Practical Application

Use Checklist Performance Objective 116 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 116 EVALUATION

SPRAYING FARM CROPS USING A FIELD SPRAYER

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Used recommended protective clothing and mask.		
2. Acquired tractor, sprayer, and needed materials.		
3. Calibrated the sprayer.		
4. Insured that sprayer is free of foreign particles and residue chemicals from previous spray operations.		
5. Checked spray nozzles for even distribution of spray needed, adjusted nozzles.		
6. Mixed spray according to directions for a particular crop.		
7. Sprayed the crop. (NOTE: know the number of gallons of water required to cover one acre for the sprayer being used). a. Sprayed the crop at the speed RPM) as previously determined by the number of gallons covered per acre. b. Took care in applying equal amount of chemical per plant, row, acre, etc.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 117

TASK

Till soil using chisel plow

STANDARD OF PERFORMANCE OF TASK

The chisel must open and roughen the soil to the desired depth (usually 10 to 12 inches).

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A situation for tilling soil using a chisel plow
A tractor with a chisel plow attached

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify various soil characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 310-312.

TEACHING ACTIVITIES

1. Identify and describe types of points and shovels for chisel plows.
2. Demonstrate the ability to service and adjust a chisel plow.
3. Discuss the proper method and reasons for using a chisel plow.
4. Practice tilling the soil with a chisel plow.
5. Have the students complete performance checklist.

PERFORMANCE OBJECTIVE 117

CRITERION-REFERENCED MEASURE

Questions

1. Chisel plows are commonly used to apply __________.
2. Chisel plows perform best when the soil is:
    a. Wet
    b. Dry and loose
    c. Dry and firm.
3. Chisel plows that penetrate the subsoil are commonly referred to as __________.

Answers

1. Anhydrous ammonia (fertilizers)
2. c
3. Subsoilers

Practical Application

The student will plow new ground using a chisel plow to teacher's satisfaction.

Method of Evaluating Practical Application

Use Checklist Performance Objective 117 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 117 EVALUATION

TILLING SOIL USING A CHISEL PLOW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Obtained tractor and equipment.		
2. Adjusted chisel plow for field operations.		
3. Tilled the soil. a. Plowed deep enough to break up deep, hard, compacted layer of soil. b. Operated the tractor/plow at a speed of 3 to 5 MPH to gain the desired tilth.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 118

TASK

Till soil using disc plow

STANDARD OF PERFORMANCE OF TASK

Disc plowing one-fourth acre of land, the soil must be turned to the desired depth (usually 8 to 10 inches) and completely inverted. Plotted area must be free of clods and weeds.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Disc Plow
One-fourth acre of land

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify soil characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 314-315.

TEACHING ACTIVITIES

1. Discuss proper method of using a disc plow.
2. Demonstrate ability to adjust and service a disc plow.
3. Differentiate between types of discs.
4. Demonstrate how to plow using a disc plow.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 118

CRITERION-REFERENCED MEASURE

Questions

1. Disc plows are used as __________ tillage tools.
2. Disc plows greatest asset is its __________.
3. Most discs are __________ in shape.
   a. Straight
   b. Concave
   c. Beveled.

Answers

1. Secondary
2. Adaptability
3. b

Practical Application

After receiving proper instructions the student will till the soil using a disc plow.

Method of Evaluating Practical Application

Use Checklist Performance Objective 118 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 118 EVALUATION

TILLING SOIL USING A DISC PLOW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired a tractor, disc plow, and appropriate operator's manual.		
2. Checked the distance between discs for same width. Adjusted if necessary.		
3. Set the angle of disc if needed.		
4. Checked the level of the plow and adjusted if necessary.		
5. Greased nipples, wheels and discs prior to the disc operation.		
6. Plowed the designated plot.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 119

TASK

Till soil using field cultivator

STANDARD OF PERFORMANCE OF TASK

Tilling one-fourth acre of land with consideration given to soil type, conditions, and moisture content. Fine particle seedbed must be established at the designated seeding depth while the surface is left rough and cloddy. Tilling must create a level, uniform, and weed-free condition.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Field Operations**, pp 204-205.

CONDITIONS FOR PERFORMANCE OF TASK

A designated one-fourth acre of land
A tractor with an attached field cultivator
Instructions for tilling

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify secondary tillage practices.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, p. 316.

TEACHING ACTIVITIES

1. Discuss the uses of field cultivators.
2. Demonstrate ability to service and adjust cultivator.
3. Have students practice calibrating tractor speed and depth of plow.
4. Have students complete performance checklist.
5. Measure student progress through observation of cultivated plot.

PERFORMANCE OBJECTIVE 19

CRITERION-REFERENCED MEASURE

Questions

1. Field cultivators operate normally in the first __________ inches of soil.
2. Field cultivators are used in preparing __________.
    a. Seed beds
    b. Terraces
    c. The subsoil.
3. The shanks provide a spring cushioned __________ action.

Answers

1. 4
2. a
3. Vibrating

Practical Application

The student will till the soil using a field cultivator to specifications outlined by the teacher.

Method of Evaluating Practical Application

Use Checklist Performance Objective 119 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 119 EVALUATION

TILLING SOIL USING A FIELD CULTIVATOR

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and instructions.		
2. Adjusted equipment as required to reduce soil particles to a size that; a. Will establish a close contact around the planted seed to encourage moisture movement into the seed. b. Retains enough soil moisture to drain away free water and permit air movement through the soil. c. Leaves a rough surface that dries out rapidly and will not germinate weed seeds.		
3. Tilled the soil. (NOTE: The amount of soil thrown into the row is a function of speed, depth of operation, and set of the cultivator). a. Operated at recommended speed (usually 3 to 7 MPH). b. Broke up the compacted soil to improve aeration and water infiltration.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 120

TASK

Till soil using moldboard plow

STANDARD OF PERFORMANCE OF TASK

Tilling one-fourth acre of land, the soil must be tilled with uniform furrow with an angle of furrow slices at about a 50° slope, and at a depth considering the following: soil type, moisture content and surface conditions.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

One-fourth acre of land
A tractor with moldboard plow attached
Instructions for tilling

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify various soil characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 303-309.

TEACHING ACTIVITIES

1. Identify and describe types of moldboards.
2. Demonstrate ability to service and adjust moldboard plow to a given situation.
3. Discuss the plowing action provided by the moldboard plow.
4. Demonstrate ability to plow using the moldboard plow.
5. Have students complete performance checklist.
6. Inspect each students plowed area for depth and uniformity.

PERFORMANCE OBJECTIVE 120

CRITERION-REFERENCED MEASURE

Questions

1. Rolling cutters are used to cut ________.
   a. Rocks
   b. Stumps
   c. Crop residues
   d. Soil.
2. The share is always the ________ part of the plow.
   a. Hardest
   b. Longest
   c. Widest.
3. The moldboard plow serves three functions, it cuts, lifts and ________ the soil.

Answers

1. c
2. a
3. Inverts

Practical Application

The student will till the soil using the moldboard plow.

Method of Evaluating Practical Application

Use Checklist Performance Objective 120 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE120 EVALUATION

TILLING THE SOIL USING A MOLDBOARD PLOW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired tractor and plow.		
2. Checked uniform weight distribution on the drive wheels.		
3. Adjusted plow depth and plow levelness.		
4. Spaced rear wheels for size of plow being used.		
5. Checked for uniform effort by each wheel and for the elimination of puddling or packing soil on the bottom of the furrow. a. After the initial adjustments, made sure surface plowed was level and that the desired plowing depth had been attained. b. If any adjustments were changed during plowing to meet different conditions, rechecked all adjustments. c. Operated the tractor/plow at a speed of 3 to 5 mph to gain the desired tilth. (NOTE: Furrow slices must have an uniform twist which provides uniform granulation.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 121

TASK

Till soil using offset disc harrow

STANDARD OF PERFORMANCE OF TASK

Tilling one-fourth acre of land, the land prepared for planting will be coarse, without clods, and uniform.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A disc harrow
Tractor
One-fourth acre of land

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify land classifications.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, p. 315.

TEACHING ACTIVITIES

1. Describe the action of the front gang versus the rear gang.
2. Demonstrate ability to service and adjust the harrow.
3. Identify and discuss applications for the offset disc harrow.
4. Demonstrate proper plowing methods.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 121 (Continued)

CRITERION-REFERENCED MEASURE

Questions

1. The gangs should be lubricated:
    a. Annually
    b. Before each use
    c. Semi-annually
    d. Never.
2. Offset disc are often called __________ discs.
3. The front gang moves in the __________ direction of the rear gang.

Answers

1. b
2. Orchard
3. Opposite

Practical Application

The student will till the soil using an offset disc harrow to specifications outlined by the teacher.

Method of Evaluating Practical Application

Use Checklist Performance Objective 121 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 121 EVALUATION

TILLING THE SOIL USING AN OFFSET DISC HARROW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired the disc harrow and the tractor.		
2. Adjusted front and rear gangs to proper height. (NOTE: the proper adjustment on the gang height will be determined by the condition of the soil and topography of the plot).		
3. Determined the speed and depth to be utilized for the disc process.		
4. Greased appropriate gang "nipples" prior to using the disc harrow.		
5. Selected course to follow in soil preparation. a. Left a rough surface that will allow free water to drain away and permit air movement through the soil. b. Killed the small weeds that may have sprouted since previous tillage.		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 122

TASK

Till soil using spike-tooth harrow

STANDARD OF PERFORMANCE OF TASK

Preparing one-fourth acre seedbed, the seedbed must be level with clods broken into small particles producing a smooth soil surface ready for planting.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A situation to use a tractor
Spike-tooth harrow to prepare a seedbed

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify proper seedbed for various crops.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, p. 317.

TEACHING ACTIVITIES

1. Discuss the physical function of the harrow on the soil.
2. Demonstrate ability to adjust and service the spike-tooth harrow.
3. Discuss planter attachments to the harrow.
4. Have students complete performance checklist.
5. Measure student progress through criterion-reference and teacher observation.

PERFORMANCE OBJECTIVE 122

CRITERION-REFERENCED MEASURE

Questions

1. The desired speed for operating a spike-toothed harrow is:
    a. 10-12 mph
    b. 3-7 mph
    c. 1-4 mph
    d. 14-15 mph.
2. Most spike-toothed harrows have a ________ attachment mounted behind the harrow.
3. The main function of the spike-toothed harrow is to break clods and ________ the surface.

Answers

1. b
2. Crumble Roller
3. To level

Practical Application

After receiving vital information the student will till the soil with a spike-tooth harrow to specifications outlined by the teacher.

Method of Evaluating Practical Application

Use checklist Performance Objective 122 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 122 EVALUATION

TILLING SOIL USING A SPIKE-TOOTH HARROW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor with attached harrow.		
2. Adjusted harrow in field for desired depth and trash clearance.		
3. Selected the course to follow in tilling the soil.		
4. Tilled the soil. a. Checked so see if seedbed was smooth and level. b. Operated equipment at desired speed (usually 3 to 7 MPH). c. Checked to see that soil was free of weeds.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 123

TASK

Till soil using spring-tooth harrow

STANDARD OF PERFORMANCE OF TASK

Tilling one-fourth acre of land, the tilled soil must be free of weeds and tilled to a depth ready for planting. Tillage must result in a uniform, smooth soil and weed-free seedbed surface ready for planting.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
A spring-tooth harrow
Up to one-fourth acre of land

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify soil characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 310-311.

TEACHING ACTIVITIES

1. Discuss theories of operation of the spring-tooth harrow.
2. Demonstrate ability to lubricate and adjust harrow for smooth operation.
3. Demonstrate proper methods of plowing with the spring-tooth harrow.
4. Have students design the proper adjustments for soil conditions.
5. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 123

CRITERION-REFERENCED MEASURE

Questions

1. The spring-tooth harrow operates:
    a. 6-10 inches
    b. 12 inches
    c. 2-5 inches
    d. 1-4 inches in the soil.
2. Adjustments are made:
    a. Each day
    b. Each month
    c. Annually
    d. Whenever needed, for tilling the soil properly.
3. Tillage, seedbeds and ________ control are accomplished using the spring-tooth harrow.

Answers

1. c
2. d
3. Weed

Practical Application

The student will till the soil using a spring-tooth harrow according to teacher standards.

Method of Evaluating Practical Application

Use Checklist Performance Objective 123 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 123 EVALUATION

TILLING SOIL USING A SPRING-TOOTH HARROW

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired a tractor, spring-tooth harrow, and operator's manual.		
2. Checked harrow teeth for: a. Rightness b. Level c. Sharpness d. General overall condition.		
3. Made all necessary adjustments to the harrow. (NOTE: Final adjustments will be determined by the condition of the soil, the topography of the land, and the time of season).		
4. Selected course to follow in soil preparation.		
5. Tilled the soil. a. Checked to see if seedbed was smooth and level. b. Operated equipment at desired speed (usually 3 to 7 MPH). c. Checked to see if soil was free of weeds.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 124

TASK

Till soil using tandem disc harrow

STANDARD OF PERFORMANCE OF TASK

Tilling one-fourth acre of soil, the tilled soil must be free of weeds and tilled to a depth of 3 inches ready for planting. Tillage must result in a uniform, smooth and weed-free seedbed.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A one-fourth acre plot of land
A tractor with an attached tandem disc harrow

ENABLING OBJECTIVES

1. Recognize safe tractor operation.
2. Identify various soil characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, p. 315.

TEACHING ACTIVITIES

1. Discuss theories of tandem engineering.
2. Discuss how the front gangs and rear gangs work together to plow the soil.
3. Demonstrate ability to service and lubricate the tandem disk harrow.
4. Have student complete performance checklist.
5. Measure student progress through teacher observation and criterion-referenced measure.
6. Identify and describe types and attachments for the tandem disk harrow.

PERFORMANCE OBJECTIVE 124

CRITERION-REFERENCED MEASURE

Questions

1. The gangs on a tandem disk harrow are offset and __________.
2. Tandem disk harrows prepare the soil for the __________ stage of row crop production.
3. The offset gangs eliminate:
    a. Soil
    b. Weeds
    c. A furrowridge
    d. Ditches, in the center of front gangs.

Answers

1. Overlapping
2. Planting
3. c

Practical Application

The student will satisfactorily till the soil using a tandem disc harrow.

Method of Evaluating Practical Application

Use Checklist Performance Objective 124 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 124 EVALUATION

TILLING SOIL USING A TANDEM DISC HARROW

Student's Name **Date**

DIRECTIONS TO STUDENT Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks wtihin a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
1. Acquired tractor and instructions.		
2. Checked operator's manual specifications for making adjustments for tilling.		
3. Adjusted tractor and equipment.		
4. Greased the disc harrow.		
5. Tilled the land. a. Left a rough surface that will allow free water to drain away and permit air movement through the soil. b. Killed the small weeds that may have sprouted since previous tillage.		

APPROVED: YES _____ NO ____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 125

TASK

Transplant tobacco with tobacco transplanter

STANDARD OF PERFORMANCE OF TASK

Transplanting one-fourth acre of land, the tobacco will be transplanted to a depth of 3 inches with the needed amount of water released per plant. Rows will either be straight or conform to the contour of the land.

SOURCE OF STANDARD

Virginia Writing Team

CONDITIONS FOR PERFORMANCE OF TASK

A tractor
Tobacco transplanter
Tobacco plants
One-fourth acre of land

ENABLING OBJECTIVES

1. Identify safe tractor operation.
2. State the procedure for handling seedlings.

RESOURCE

Powell Automatic Pick-up Transplanters Model '420', pp.2-7.

TEACHING ACTIVITIES

1. Discuss theories of operation of various types of transplanters.
2. Discuss and illustrate the automatic plant pick up system.
3. Demonstrate ability to service and adjust transplanter.
4. Discuss proper row and plant spacing achieved by the transplanter.
5. Demonstrate the use of the transplanter.
6. Have students complete performance checklist.

PERFORMANCE OBJECTIVE 125

CRITERION-REFERENCED MEASURE

Questions

1. The three types of furrow openers are sliding, pointed and __________.
2. The two types of pickup hands are __________ and glove hands.
3. The best fertilizer placement method for tobacco is ____________________.

Answers

1. Flared
2. Mitten
3. Double banded

Practical Application

After proper instruction by the teacher the student will transplant tobacco using the Powell transplanter.

Method of Evaluating Practical Application

Use Checklist Performance Objective 125 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 125 EVALUATION

TRANSPLANTING TOBACCO WITH A TOBACCO TRANSPLANTER

Student's Name **Date**

DIRECTIONS TO STUDENT	Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.
DIRECTIONS TO EVALUATOR	Observe the student. Pay close attention to items to be evaluated. Be sure the student completes the tasks within a reasonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
1. Acquired tractor and tobacco transplanter.		
2. Checked moving parts on transplanter for free movement (wheels, linkage, valves, etc.).		
3. Set transplanter for proper depth and water release per plant.		
4. Transplanted tobacco using tobacco transplanter.		
5. Made rows as straight as possible following the contour of the land. (NOTE: Keep all row spacing uniform.)		

APPROVED: YES _____ NO _____

Evaluator's Signature **Date**

DUTY PERFORMING FIELD OPERATIONS

PERFORMANCE OBJECTIVE 126

TASK

Unload forage crop using silo unloader

STANDARD OF PERFORMANCE OF TASK

The silage must be unloaded without excess spillage and waste as determined by the instructor.

SOURCE OF STANDARD

Virginia Writing Team
Deere. **Fundamentals of Machine Operation: Agricultural Machinery Safety**, pp 295-297.

CONDITIONS FOR PERFORMANCE OF TASK

A silo unloader
Forage crop
Necessary equipment
Silo

ENABLING OBJECTIVES

1. Recognize power take off safety and operation.
2. Identify forage crop characteristics.

RESOURCE

Jacobs, et al., **Agricultural Power and Machinery**, pp. 399-400.

TEACHING ACTIVITIES

1. Discuss in detail safety instructions for operating a silo unloader.
2. Identify and discuss types of silos.
3. Demonstrate ability to service and lubricate the silo unloader.
4. Review and explain step by step operation of the silo unloader.
5. Have student practice the step by step process with the power off.
6. Have student complete performance checklist.
7. Analyze and observe each student during operation.

PERFORMANCE OBJECTIVE 126

CRITERION-REFERENCED MEASURE

Questions

1. ____________ is the key word when working with PTO equipment.
2. Normally an operator must work the unloader and the silage ____________ at the same time.
3. Silos made of steel and lined with glass are know as:
    a. Trench silos
    b. Oxygen-limiting silos
    c. Bunker silos
    d. Horizontal silos.

Answers

1. Safety
2. Blower
3. b

Practical Application

After receiving proper instruction the student will safely unload a forage crop using a silo unloader.

Method of Evaluating Practical Application

Use Checklist Performance Objective 126 to determine if the assignment was completed with 100 percent accuracy.

CHECKLIST FOR PERFORMANCE OBJECTIVE 126 EVALUATION

UNLOADING A FORAGE CROP USING A SILO UNLOADER

Student's Name **Date**

DIRECTIONS TO STUDENT — Prepare the proper equipment. Follow the verbal directions given by the instructor. Complete each step in the sequential order listed.

DIRECTIONS TO EVALUATOR — Observe the student. Pay close attention to items to be evaluated. Be sure the student complete the task within a resonable time. A score of 100 percent is required for competency.

ITEMS TO BE EVALUATED	**RATING**	
	Satisfactory	**Unsatisfactory**
Upright silo		
1. Read operator's manual.		
2. Checked for proper assembly--tripod and cable, knife-studded augers, driving rollers, and power supply.		
3. Positioned unloader.		
4. Checked electric motor and belt for tension.		
5. Engaged motor.		
6. Stopped silo unloader.		
Trench silo		
1. Read operator's manual.		
2. Hitched trench unloader to tractor.		
3. Checked belt tension and power take off, cutting knives, and proper length of cut.		

CHECKLIST FOR PERFORMANCE OBJECTIVE 126 EVALUATION

ITEMS TO BE EVALUATED	RATING	
	Satisfactory	Unsatisfactory
4. Positioned hopper and conveyor to fill transport vehicle.		
5. Engaged PTO clutch at reduced throttle.		
6. Adjusted speed to manufacturer's recommendations.		
7. Stopped the silage unloader.		

APPROVED: YES _____ NO _____

Evaluator's Signature Date

FARM EQUIPMENT OPERATOR

APPENDICES

APPENDIX A

TASK LIST AND JOB TITLES

APPENDIX A

TASK LIST AND JOB TITLES

Job Titles
Farm Equipment Operator
Supervisor, Farm Equipment
Operator

DOT Code
409.883-010
409.883-020

	Duty/Task	P.O./ Page Number
A.	Performing Routine Administrative Functions	
01	Assign jobs	1/5
02	Contract for fuel supplies	2/8
03	Dismiss employee	3/11
04	Establish records for purchasing equipment	4/14
05	Hire employee(s)	5/17
*06	Keep daily engine hour and operation logs	---
*07	Keep daily fuel, oil, and hydraulic fluid consumption logs	---
08	Maintain inventory lists	6/20
09	(A13) Maintain payroll records	---
10	Maintain service records and logs	7/23
11	Order fuel and petroleum supplies for farming operation	8/26
12	Order replacement parts	9/29
13	(A9) Prepare payroll and mail check	10/32
14	Purchase new or used equipment	11/35
15	Select equipment for specific jobs	12/38
16	Set priorities for ordering equipment	13/41
17	Train employees in the maintenance and servicing of farm equipment	14/45
18	Train employees in the operation of farm machinery	
*19	Supervise grain drying	---
*20	Supervise planting and harvesting	---
*21	Maintain books on cash receipts and expenses	---
*22	Oversee farm operations and animals	---
B.	Performing Scheduled Farm MachineryMaintenance	
01	Change engine oil and filter	16/52
02	Change hydraulic fluid in hydraulic reservoir	17/56
03	Check tire pressure	18/59
04	Lubricate and grease chassis fittings	19/62

	Duty/Task	P.O./ Page Number
05	Prepare farm machinery for storage	20/66
06	Prepare farm machinery for use after storage	21/69
07	Repack front wheel bearings	22/72
08	Replace diesel fuel filter	23/76
*09	Replace diesel fuel injectors	---
10	Replace filters, screens and breathers on hydraulic systems	24/79
11	Replace front wheel bearing and grease seal	25/82
12	(B15) Replace points, rotor and condensor (Replace ignition breaker points, rotor and condensor)	26/86
13	(B14) Replace distributor cap (Replace ignition distributor cap)	27/89
14	(B13) Replace magneto cap	---
15	(B12) Replace magneto points,condenser and rotor	---
16	Replace radiator and heater hoses	28/92
17	Replace spark plugs	29/96
18	Replace V-belts	30/99
19	Service air cleaner (dry type or paper cleaner) (Service air cleaner, dry type)	31/102
20	Service air cleaner (oil-bath type) (Service air cleaner oil type)	32/105
21	Service breather for oil reservoir	33/109
22	Service filters, screens, andbreathers on hydraulic systems	34/112
23a	Service tractor fuel system(gasoline engine) (Service fuel filters and lines on gasoline engines)	35/115
23b	Service tractor fuel system (diesel engine) (Service fuel filters and lines on gasoline engines)	36/118
24	Service hydraulic implementcontrol system	37/122
25	Service hydraulic power steering system	38/125
26	Service the cooling system	39/128
27	Test and service battery	40/131
*28	Install section sickle bar	---
*29	Maintain field sprayer	---
C.	Performing Nonscheduled FarmMachinery Maintenance	
01	Adjust band brakes	41/136
02	Adjust carburetor air/fuel/idle mixture	42/139
03	Adjust disc brakes	43/142
04	Adjust drawbar	44/145
05	Adjust drum brakes	45/148
06	(C7) Adjust engine governor(Adjust engine governor (diesel))	46/151
07	(C6) Adjust engine governor (gasoline)	---
08	Adjust engine valves	47/154
09	Adjust foot clutch	48/158
10	Adjust front wheel bearings	49/161
*11	Adjust hand clutch	---
12	Adjust headlights	50/164
13	(D6) Adjust hydraulic cylinder actuators	---
14	Adjust ignition timing	51/167
15	Adjust V-belts	52/171

	Duty/Task	P.O./ Page Number
16a	Adjust wheel spacing (front)	53/174
16b	Adjust wheel spacing (rear)	54/177
17	Arc weld steel to steel	55/180
18	Bleed hydraulic accessory system and components	56/183
*19	Braze brass to brass	---
20	Braze sheet metal	57/186
*21	Braze steel to brass	---
*22	Check and correct tire slippage on rim	---
23	Clean carburetor	58/189
24	Cut stock metal for repairing farm machinery using an oxyacetylene torch	59/192
25	Form metal (bend, shape) using an oxycetylene torch to repair farm machine	60/195
26	(C77) High pressure clean machinery with engines using water and chemicals	---
27	(C77) High pressure clean machinery without engines using water and chemicals	---
*28	Install and remove tractor mounted corn picker	---
29	Install and remove tractor mounted cultivator	61/198
30	Install and remove tractor mounted mowers	62/201
31	Mount SLOW MOVING VEHICLE emblems on farm machinery	63/204
32a	Patch broken sheet metal on farm machinery by riveting	64/207
32b	Patch broken sheet metal on farm machinery by soldering	65/210
33	Purge diesel fuel system (bleed air from lines)	66/213
34	Rebuild carburetor using small parts kit	67/216
35	(C36) Refuel farm machinery (diesel)	68/220
36	(C35) Refuel farm machinery (gasoline)	---
37	Remove and replace defective machinery guards and shields	69/223
38	Remove or add ballast weights to tractor	70/226
39	Repair tire by patching	71/229
*40	Repair tire by plugging	---
*41	Replace air conditioner hoses	---
42	Replace alternator	72/232
43	Replace auxiliary lights	73/235
44	Replace battery	74/238
45	Replace exhaust pipes and mufflers	75/241
46	Replace flasher lights bulbs	76/244
47	Replace flasher unit	77/247
48	Replace front wheel	78/250
49	Replace fuel line	79/253
*50	Replace fuel solenoid shutoff valve	---
51	Replace generator	80/256
52	Replace headlights	81/259

	Duty/Task	P.O./ Page Number
*53	Replace headlight switch	---
*54	Replace heater control switch	---
*55	Replace instrument lights	---
*56	Replace instrument light switch	---
*57	Replace magneto	---
58	(C59) Replace oil pressure gauge	82/262
59	(C58) Replace oil pressure sensor unit	---
60	Replace rear wheel	83/265
61	Replace starter	84/268
62	Replace starter solenoid	85/271
63	Replace taillights	86/276
64	(C65) Replace temperature gauge	87/279
65	(C64) Replace temperature sensor unit	---
66	Replace thermostat	88/282
67	Replace voltage regulator	89/286
68	Replace warning signal or implement lights	90/289
*69	Replace windshield wiper blades	---
*70	Replace windshield wiper control switch	---
*71	Replace windshield wiper motors	---
72	Sharpen conventional baler shearer plate knife	91/292
73	Sharpen ensilage cutter knives	92/295
74	Sharpen rotary mower blades (bush hog)	93/298
75	Sharpen sickle bar	94/301
76	Start engine using jumper cables	95/304
77	(C26, C27, C78) Steam/high pressure clean machinery (Steam clean machinery with engines)	96/308
78	(C77) Steam clean machinery without engines	---
*79	Clean gas tanks	---

D. Performing Field Operations

01	Attach farm equipment to drawbar	97/313
02	Bale hay using "big" round baler	98/316
03	Bale hay with conventional "square" baler	99/3198
04	Clear brush and weeds with rotary mower (bush hog)	100/322
*05	Collect conventional hay bales with self loading hay wagon	---
06	(C13) Connect remote hydraulic cylinders	101/325
07	Cultivate crops with the rotary hoe	102/328
08	Cultivate crops with the row crop cultivator	103/331
*09	Cultivate orchard using rotary tillers	---
10	Cut hay with a mower-conditioner	104/334
11	Cut hay with a (swather) bar mower	105/337
12	Drive farm equipment on roads and highways	106/340
13	Fertilize soil for planting using fertilizer spreader	107/343
14	Fill silo with silo blower	108/346
*15	Harvest asparagus using special harvester	---
*16	Harvest beans (green) using special harvester	---
*17	Harvest beans (lima) using special harvester	---
*18	Harvest beets using special harvester	---
*19	Harvest cabbage using special harvester	---

	Duty/Task	P.O./ Page Number
*20	Harvest cantaloupe using special harvester	---
*21	Harvest carrots using carrot digger	---
*22	Harvest celery using celery cutter	---
*23	Harvest corn (sweet) using modified field corn picker	---
24	Harvest corn with a corn picker	109/349
*25	Harvest cotton with a cotton picker	---
26	Harvest crops with a combine	110/352
*27	Harvest cucumbers using special harvester	---
28	Harvest forage with a forage chopper	111/355
*29	Harvest leafy vegetables using leafy vegetable harvester	---
*30	Harvest onions using onion digger	---
*31	Harvest parsnips using parsnip digger	---
*32	Harvest peanuts with a peanut harvester	---
*33	Harvest peas (green) using special harvester	---
*34	Harvest peppers (bell) using special harvester	---
*35	Harvest potatoes, rutabagas and turnips with special digger	---
*36	Harvest potatoes with a potato digger	---
*37	Harvest radishes using special harvester	---
*38	Harvest tomatoes using special harvester	---
*39	Move large hay stack with "transporter"	---
*40	Move large round hay bales with base transporter	---
*41	Plant potatoes with potato planter	---
42	Plant row crops with conventional row crop planter	112/358
43	Plant row crops with grain drill	113/362
44	Plant row crops with no-till row crop planter	114/365
*45	Plant row crops with special vegetable planter	---
46	Rake hay	115/368
47	Spray farm crops using field sprayer	116/371
*48	Spray orchards using air blast sprayer	---
*49	Take up hay using large package wagon (i.e. stockhand)	---
50	Till soil using chisel plow	117/374
51	Till soil using disc plow	118/377
52	Till soil using field cultivator	119/380
53	Till soil using moldboard plow	120/383
54	Till soil using offset disc harrow	121/386
55	Till soil using spike-tooth harrow	122/389
56	Till soil using spring-tooth harrow	123/392
57	Till soil using tandem disc harrow	124/395
58	Transplant tobacco with tobacco transplanter	125/398
*59	Transplant vegetables with vegetable transplanter	---
60	Unload forage crops using silo unloader	126/401
*61	Clip pasture	---
*62	Level land for planting	---
*63	Till soil using drag	---

APPENDIX B

DEFINITION OF TERMS

APPENDIX B

DEFINITION OF TERMS

A number of terms frequently used in this guide may be unfamiliar to the reader; others may be familiar, but in the context of this handbook have been assigned special meanings.

AFFECTIVE.
Skills which emphasize an attitude, feeling, emotion, or degree of acceptance and rejection.

CATALOG.
A comprehensive collection of performance objectives, performance guides, and related data developed in a specific domain.

CBVE (COMPETENCY-BASED VOCATIONAL EDUCATION).
A methodology of instruction that (a) identifies the abilities and skills needed for on-the-job performance; (b) informs students and teachers of the precise and detailed learning objectives required to achieve these competencies; (c) emphasizes performance standards in testing, course requirements, and/or graduation; and (d) facilitates learning by letting each student master the tasks prior to advancing to another.

CHECKPOINT.
A point in the development of the V-TECS product when material must be sent to V-TECS central office for quality review.

CIP (CLASSIFICATION OF INSTRUCTION PROGRAM) CODE.
A code developed by the U.S. Office of Education to identify a specific cluster of related jobs for training program identification.

COGNITIVE.
Skills which emphasize the recall of knowledge and development of intellectual abilities.

COMPETENCY.
Proficiency in the knowledge and skills required of workers in a particular occupation or occupational specialty; a term used by educators to mean essentially program goal, duty, task, or objective. In some cases the terms are essentially synonymous.

CONDITIONS.
Describes the situation for competent task performance, including tools and equipment to be used, and limitations under which the tasks will be performed.

CONSORTIUM.

A group of state agencies, institutions, or other entities which have been legally constituted through letters of commitment, agreements, or by assignment of higher authorities to work together toward the solution of problems in education. A consortium, for the purposes of this work, must have membership from autonomous agencies and institutions which cut across state boundaries as they attempt to solve problems or meet goals.

CRITERION-REFERENCED MEASURES.

An evaluative procedure used to determine if a student has mastered a performance objective.

CROSS-REFERENCE TABLE.

A table that identifies the relationship among duties and tasks found in the occupational inventory and the performance objectives in the final catalog. Also noted are percentages of incumbents performing the tasks by D.O.T.

CURRICULUM GUIDE.

An instructional resource developed from a V-TECS catalog to guide CBVE for an occupation.

DICTIONARY OF OCCUPATIONAL TITLES (D.O.T.).

A document published by the U.S. Department of Labor, Employment and Training Administration. This publication groups occupations into systematic occupational classification structures based on interrelationships of job tasks and requirements.

DISTRACTOR.

An incorrect response to a multiple-choice or true/false test item.

DOMAIN (OCCUPATIONAL DOMAIN).

A group of job titles that are related on the basis of required skills and knowledge.

D.O.T. CODE.

A nine-digit number used to identify a specific job within a given calendar year.

DUTY.

A cluster of related tasks performed by incumbent workers in an occupational domain.

ENABLING OBJECTIVE.

An objective related to background knowledge or skills that are prerequisite to the mastery of a given task.

FIELD REVIEW.

The process of using and refining drafts of V-TECS materials for the purpose of identifying content errors or technical problems.

GUIDE SHEET.

Instructional information including the duty, performance objective, task,. performance of standard, survey of standard, conditions for performance of tasks, enabling objectives,resources, teaching activities, criterion-references measures, and performance guide.

JOB.

A group of tasks performed by a job incumbent.

JOB INCUMBENT.

An individual who is currently employed in an occupation.

OCCUPATIONAL ANALYSIS (Task Analysis).

The process of reviewing elements of a job for the purpose of improving training program content across program levels of vocational-technical education.

OCCUPATIONAL INVENTORY(Task Inventory Booklet).

A survey instrument listing tasks performed and tools and equipment used by job incumbents in an occupational domain.

OCCUPATIONAL SURVEY.

The procedures for collecting data to identify the duties and tasks that comprise one or more jobs, job types, or career field ladders for the collection and analysis of information concerning such duties.

O.E./CIP CODE.

A code developed by the U.S. Office of Education to identify a specific cluster of related jobs for training program identification.

PERFORMANCE-BASED INSTRUCTION.

Instruction which requires the learners demonstration of specific competencies. The desired abilities are selected before the instruction is described and are clearly defined as observable performance objectives.

PERFORMANCE CHECKLIST.

A list of performance steps derived from the performance guide to record acceptable or unacceptable performance of each step of a task.

PERFORMANCE GUIDE (PG).

A series of steps required for performance of a task arranged in the sequence ordinarily followed.

PERFORMANCE OBJECTIVE (PO).

A statement, in precise measurable terms, of a particular behavior to be exhibited by a learner under specified conditions, including a standard of performance.

PSYCHOMOTOR.

Skills which emphasize manipulation of material or tools.

QUALITY REVIEW.

A review of content by V-TECS staff or designated representative to examine quality of content, format, and style of V-TECS product(s).

RESOURCES.
Materials which are used to develop instruction and/or learner-specific objectives.

SOURCE OF STANDARD.
A person or origin from which the information establishing the standard is received.

STANDARD.
The criteria used to determine if a task has been successfully or unsuccessfully performed.

STATE-OF-THE-ART REFERENCE.
Current materials from which information or resources can be found to facilitate instruction.

STATE-OF-THE-ART (SOA) STUDY.
Research conducted to determine the current status of performance-based instructional materials and practices in the domain area under study and to obtain other information that might be useful in catalog development.

SUBJECT-MATTER EXPERT.
A highly experienced person(incumbent worker/instructor) who assists in identifying task performance steps, skills, and knowledge necessary to perform the job.

TASK.
A unit of work activity which constitutes logical and necessary steps in the performance of a duty. A task has a definite beginning and ending point in its accomplishments and generally consists of two or more definite steps.

TASK ANALYSIS.
The process of reviewing elements of a job for the purpose of improving training program content across program levels of vocational technical education.

TASK LIST.
A list of tasks performed by incumbents in a specific occupation domain.

TEACHING ACTIVITIES.
Methods and/or procedures for delivering instructional content to students.

TEST-ITEM BANK.
A collection of criterion-referenced test items coded for input and retrieval by computer or manual methods.

VALIDATION.
The process of assuring that all aspects of an occupational task analysis identifies the skills, knowledge, and attitudes performed in the occupation.

VERIFICATION.
The procedure of collecting data to substantiate an existing product, for example, task list verification.

V-TECS.

An acronym representing: Vocational-Technical Education Consortium of States; 795 Peachtree Street, N.E., Atlanta, Georgia 30365. A consortium of states that provide competency-based, vocational-technical education materials while conserving time and money through shared development and dissemination.

V-TECS CATALOG.

An incumbent-based description of the duties, tasks, performance objectives, performance guides, and related data in a specified occupation.

WORKING CONDITIONS.

The atmospheric and environmental conditions under which a worker performs a specific job.

WRITING TEAM.

A team of people representing instructors with subject matter expertise; persons having knowledge and experience in developing criterion-referenced measures; local or state supervisors in the domain being developed; workers and supervisors of incumbent workers whose function is to analyze occupational data and develop performance objectives for specific D.O.T. areas.

APPENDIX C

TOOLS/EQUIPMENT/WORK AIDS

APPENDIX C

TOOLS AND EQUIPMENT

EQUIPMENT BY PERCENTAGE RATING

Equipment Number	Equipment Description	Percentage Using	Number Using
26	Grease gun	99.45	180
28	Hammer	99.45	180
43	Shovel	98.90	179
6	Axe	97.24	176
27	Hack saw	97.24	176
22	Fuel can	96.69	175
44	Sledge hammer	96.69	175
34	Jumper cable	95.58	173
24	Funnel	95.03	172
46	Tape measure	94.48	171
62	Moldboard plow	94.48	171
58	Wheel-type tractor	93.92	170
20	Electric drill	92.82	168
124	Chain saw	92.82	168
150	SLOW MOVING VEHICLE emblem	92.82	168
29	Hatchet	92.27	167
56	Pick-up truck	88.95	161
23	Fuel storage unit	87.85	159
41	Pry bars	86.74	157
49	Tire pressure gauge	86.74	157
35	Mechanics tool set	85.64	155
31	Hydraulic jack	82.32	149
54	Four wheel wagon	81.77	148
139	Sprayer	79.01	143
5	Assorted files	78.45	142
3	Antifreeze tester	77.35	140
11	Bench grinder	75.69	137
57	Two wheel trailer	75.69	137
110	Rake	75.14	136
136	Rotary mower (bush hog)	74.59	135
8	Battery charger	72.38	131
42	Safety glasses, goggles and hood	72.38	131
69	Conventional row crop planter	72.38	131
48	Tire inflation unit (air compressor)	71.27	129
61	Field cultivator	71.27	129
71	Grain drill	70.17	127
137	Scraper	70.17	127
55	Large farm truck	67.40	122
135	Post hole digger	67.40	122
12	Chain binder	66.30	120

Equipment Number	Equipment Description	Percentage Using	Number Using
67	Tandem disc harrow	65.75	119
21	Feeler gauges (leaf)	62.98	114
77	Row crop cultivator	68.98	114
130	Front end loader	62.98	114
133	Manure spreader	62.98	114
104	Baler (conventional)	61.33	111
66	Spring booth harrow	59.12	107
128	Fertilizer applicator/spreader	57.46	104
144	Fire extinguisher	57.46	104
47	Taps and dies	56.35	102
65	Spike tooth harrow	55.80	101
102	Bale elevator	55.80	101
4	Arc welder unit	53.59	97
51	Wire stinger	53.59	97
17	Drain pan	53.04	96
13	Chain hoist	52.49	95
40	Protective gloves/apron	51.93	94
86	Combine	49.17	89
68	Broadcast planter	45.86	83
87	Corn picker	44.75	81
131	Grain elevator/auger	44.75	81
145	First aid kit	44.20	80
39	Portable grinder	43.65	79
105	Bale wagon	43.09	78
125	Culipacker	42.54	77
18	Drill press	41.99	76
14	Chipping tool/brush	41.44	75
63	Offset disc	40.88	74
36	Oxyacetylene cutting torch	40.33	73
72	No-till row crop planter	39.78	72
60	Disc plow	39.23	71
52	Wire stripper	38.67	70
15	Compression gauge	37.57	68
37	Oxyacetylene welding torch	37.02	67
59	Chisel plow	35.36	64
115	Swather bar mower	35.36	64
119	Forage chopper/harvester	35.36	64
126	Feed grinder (mixer)	34.25	62
142	C-B radio	33.70	61
50	Torque wrench	32.60	59
107	Haybine (mower conditioner)	32.60	59
121	Silage wagon	32.04	58
10	Battery tester	31.49	57
127	Fence post driver	29.83	54
120	Silage blower	29.28	53
140	Subsoiler	28.73	52
32	Ignition timing light	28.18	51
64	Rotary power tiller	28.18	51
76	Rotary hoe	27.07	49

Equipment Number	Equipment Description	Percentage Using	Number Using
33	Impact wrench	26.52	48
70	Field distributor	25.97	47
75	Tobacco transplanter	24.31	44
25	Fuse puller	21.55	39
30	High pressure/steam cleaner	21.55	39
38	Portable generator	20.99	38
9	Battery hydrometer	20.44	37
122	Silo unloader	19.89	36
132	Lister (making bed)	19.89	36
7	Band saw	19.34	35
1	A-frame hoist	18.78	34
2	Amp/volt/regulator meter	18.23	33
129	Fork lift	14.92	27
16	Continuity tester (ohm meter)	13.81	25
143	Ear plugs	13.81	25
19	Dwell meter	13.26	24
106	Bale wagon (for use with baler and ejector)	12.15	22
53	Crawler tractor	11.60	21
149	Safety belt and line	11.05	20
148	Rubber or vinyl suit for chemical application	9.39	17
103	Bale loader	8.29	15
74	Specialized vegetable transplanter	5.52	10
93	Peanut digger	4.97	9
95	Peanut harvester	4.97	9
112	Round "big" baler	4.97	9
141	Bump hat	4.97	9
97	Potato digger	4.42	8
118	Flail chopper	4.42	8
73	Potato planter	3.87	7
100	Tobacco harvester	3.31	6
114	Square stalk wagon (loose hay)	3.31	6
138	Skid steer loader	3.31	6
111	Round "big" bale mower	2.76	5
109	Hay stacker	1.66	3
116	Ensilage mixer (oswait)	1.10	2
123	Apple picker	1.10	2
151	Apple harvester	1.10	2
153	Corn binder	1.10	2
79	Bean (green) harvester	0.55	1
83	Cantaloupe harvester	0.55	1
84	Carrot digger	0.55	1
85	Celery cutter	0.55	1
88	Cotton picker	0.55	1
90	Leafy vegetable harvester	0.55	1
91	Onion digger	0.55	1
94	Pea (green) harvester	0.55	1

Equipment Number	Equipment Description	Percentage Using	Number Using
101	Tomato harvester	0.55	1
152	Arc welder	0.55	1
154	Dry dust sprayer	0.55	1
155	Drying bins	0.55	1
156	Drying trailers	0.55	1
157	Dump wagon	0.55	1
158	Electric poultry feeder	0.55	1
159	Grain dryer	0.55	1
160	Gravity bed wagon	0.55	1
161	Hay tedder	0.55	1
162	Liquid manure scoop (front end)	0.55	1
163	Mowing machine	0.55	1
164	Pick up disc harrow	0.55	1
165	Portable water pump	0.55	1
166	Potato harvester	0.55	1
167	Silage truck	0.55	1
168	Shredder	0.55	1
169	Sod seeder	0.55	1
170	Stack mower	0.55	1
171	Table saw	0.55	1
172	Three point hitch carry all	0.55	1
173	Tire breaker	0.55	1
174	Tractor mounted crane	0.55	1
175	Tractor mounted liquid fertilizer applicator	0.55	1
176	Tractor pull type liquid fertilizer applicator	0.55	1
177	Truck mounted liquid fertilizer applicator	0.55	1
179	Field renovator	0.55	1
78	Asparagus harvester	0.00	0
80	Bean (lima) harvester	0.00	0
81	Beet harvester	0.00	0
82	Cabbage harvester	0.00	0
89	Cucumber harvester	0.00	0
92	Parsnip digger	0.00	0
96	Pepper (bell) harvester	0.00	0
98	Radish harvester	0.00	0
99	Sugar beet digger	0.00	0
113	Mechanical vegetable thinners	0.00	0
		TOTAL RESPONDENTS	181

APPENDIX D

SOURCES OF STANDARDS

APPENDIX D

SOURCES OF STANDARDS

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STATE-OF-THE-ART LITERATURE

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